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THE

Psychological Bulletin

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THE
PSYCHOLOGICAL BULLETIN

GENERAL REVIEWS AND SUMMARIES

PSYCHOLOGICAL PROGRESS IN 1911

BY PROFESSOR EDWARD FRANKLIN BUCHNER

Johns Hopkins University

The year just closed presented a variety of events and results which show a steadily increasing vitality in the science of psychology. Wearying of "the patient search and vigil long" in the quest of the true object of their ceaseless inquiries, some psychologists would have us modify our intentions by such definition as will make the object unquestionably clear and certain. The term "consciousness" seems to face the dangers which years ago routed the terms "soul" and "mind" from our vocabulary. The philosophers, too, seem so to weight their current problems in terms of realism, humanism and "Bergsonianism," as to let the metaphysical gravitation of consciousness move it out of the system of the empirical relations which are of right preëempted by and for the scientific methods of psychology. The focalized expression of this tendency appeared among American psychologists by whom the use and meaning of the terms was especially discussed at the Minneapolis meeting in 1910. In its place it is proposed to substitute the term "behavior," as is done, for example, by Pillsbury (15) in his definition of psychology as "the science of human behavior." This is proposed in the interest of the permanent objectivity of the facts of the science. The argument of Singer (20) is positive that "consciousness is not something inferred from behavior, it is behavior." The dangers of an ambiguity in speech, of the elimination of all introspection and of the study of the psychology of animals, and the narrowing of experience to a possible single mode of movement do not seem to be effective as checks in the adoption of the sub-

stitute. Tawney (21) is more temperate, but not less deviating, in his expression of a pedagogically felt need for a reconstructed science that will develop without serious break into the correlated disciplines. While "it is all very well to write psychology for the sake of psychology, and to work steadily under the lead of facts, . . . we need a psychology of human conduct to supplant the psychology of consciousness."

In his criticism of psychology as experimental, Kostyleff (7), upbraids it as lacking system in its methods and objects of research, presenting too much variety and planlessness in its investigations, and exhibiting individuals who follow masters rather than attack fundamental problems. While its measurements and graphs and laws may be interesting, they cannot become explanations, but remain only questions. This criticism entirely forgets that scientific experimentation is fruitful because the analysis of any particular phenomenon is never carried to completion. Progress is possible only on condition that this is not done. Complete treatment, in requiring unending time and effort, would preclude all attempt at hypothesis and explanation. Braunhausen (2) offers as a refutation of this criticism a brief and richly compacted review of the work and results of modern psychology.

The first answer to these and similar doubts as to the worth of psychology is, however, to be found in the revision of Ladd's *Elements of Physiological Psychology*, the appearance of which is the most interesting single event of the year (8). The first edition of this classic appeared in 1887, and passed through ten reprintings. That the work is, after nearly a quarter of a century, subject to such a wide revision as to incorporate the neurone theory, the facts of the evolution of the brain, and the latest experimental data without losing its original identity, even as to the number of chapters and pages, is probably the best evidence our literature has given us of the inner vitality of psychological methods, and the clear perspective of the safe direction its researches have been taking. It presents our best survey of the varied material in the organizing and reorganizing fund of knowledge which psychology can now claim as its own. A comparison of the revised edition with the original shows exactly the advancement in the experimental and objective character of this knowledge, at once an answer to the critic and an indication of the progress for which he should be inquiring. From these points of view this work becomes historically more interesting than the famous *Grundzüge*, the completion of

whose sixth edition was chronicled one year ago. The appearance of second editions of the manuals by Myers (14) and by Toulouse and Piéron (23) is further indication of the sufficiency of exact methods and a welcome sign of the seriousness in English and French experimental psychology.

The spread of experimental technique over the field of the thought processes was the most considerable and daring advance made in the first decade of this century. Now a similar attempt at controlled introspection is passing over into the field of voluntary phenomena, and happily, with a fair degree of assurance that the results are reliable. Continuing the work begun by Ach and by Bovet, and reaching results partly agreeing and partly disagreeing with theirs, Michotte and Prüm (13) used reaction methods in securing their contribution to the descriptive psychology of will. They aimed to bring out in relief the problems of motivation and determination. In the final stage of the latter, the observers found the phenomenon of choice to be a consciousness of doing, but not as a content alongside of other contents. Now that the initial difficulties, interposed by logic, ethics, and the earlier conclusions of psychology precluding these fields, have been overcome, it is hoped that future progress will not be hindered by the controversial side-issues of misunderstanding.

The renewed efforts of recent years to make the technique of the science definitive and applicable in the measurement of individuals, both in particular processes and as a whole, have been fortunately advancing towards at least working, if not assured results. The excellent contribution of Whipple last year is now followed by the report of the special Committee of the American Psychological Association (18) and the spreading interest in trying out the Binet-Simon scale for measuring intelligence and its development. As early as 1896 the American Psychological Association made its first effort to standardize mental tests, which did not get beyond the statement of the general problem. The work of the permanent Committee of 1906, which is ripening slowly, becomes peculiarly serviceable by bringing the different methods of procedure together in such a way as to be mutually corrective. A fresh and potent incentive is now at hand for re-experimentation by psychologists in these newly charted fields. As if by common consent, the other line of coöperative work is being done in the sudden spread of interest in the applicability and validity of the scale of intelligence. Meumann (12), in specifying the four aims to be realized by these tests, viz. the psychiatric, the

tests to determine the limits of abnormality and the typical intelligence disorders in childhood, tests to analyze the normal adult, and also normal children, raises as a new problem the question, to what extent may an individual (especially a child) deviate mentally from the normal average for a given age and still be normal? Bobertag (1) has reviewed the work done in 1910. Binet and Simon (3) have extended and simplified their 1908 order of tests so as to include the fifteen-year-olds and over, and to measure each year (except the fourth, which has four questions), with five tests. Goddard (4), in trying the tests on a homogeneous group of two thousand normal children, reaches the conclusion that we have now "a mathematical demonstration of the accuracy of the tests," particularly for the ages of five to twelve years. In the "Symposium on the Binet Tests" in the *Psychological Clinic* (16), Terman presents the results obtained from four hundred non-selected children. The organization of committees and institutes in Europe to promote further investigations, mentioned below, indicates an unusually serious belief in the value of standardized mental tests.

The phenomena of dreams have long been a region of opinion and superstition. One may now ask, with some hope of an affirmative answer, whether this field shall finally yield to sound theory. The continued development of the method of psychoanalysis and the extension of Freud's theories to the explanation of traits recorded in biography is a matter of importance in spite of its lack of general acceptance. Vold (24) was probably the first to apply the methods of careful control and comparison to dreams, this strange material of experience which seems to be beyond all control. In attempting to determine dreams experimentally, by tightly placed bands chiefly on the lower limbs, he found for example, in tests on nineteen subjects, experimental dreams contained two and a half times the elements recallable in ordinary dreams. It also appears that motor ideas are most frequently aroused in controlled dreams, ideas of pressure and temperature only slightly so. Hollingsworth's observations on the transition state between waking and sleeping may lead to a further inquiry into the psychology of dreams (6).

From the abundance of other expressions of tendencies and advances, mention may be made of the following fruits of the year. Continuing the American pedagogical practice of demonstrating a position by constructing a text-book, Yerkes (25) has issued a clear call to the science to hark back to the importance of introspection and to a recognition of psychical causation. His exhibition of the gen-

eralization of the science (part IV.) is a striking presentation of the extensive scientific claims it now possesses. In the effort to use the projection method for studying imagery by Martin (11), and the demonstration of the meaning and extent of psychography by Margis (9, 10), the range of possible improvement in methods is indicated. A new meaning of comparative psychology is given in the suggestive study by Hamilton (5), whose subjects were eleven humans, five monkeys, sixteen dogs, five cats, and one horse. The reprinting of the papers by Thorndike (22), who first made the experimental attack on the problems of animal psychology over a decade ago, affords an opportunity to note the general soundness of his interpretations, as well as a basis for estimating the progress in technique and theory which may have been made in the meantime in this branch of the science.

1909		1910	
No. of Titles	Rubric	No. of Titles	Rubric
739	Genetic, individual and social psychology.	712	Genetic, individual and social psychology.
512	Philosophical implications of psychology.	587	Sleep, trance and pathology.
512	Sleep, trance and pathology.	471	Sensation.
358	Sensation.	417	Philosophical implications of psychology.
322	General.	292	Anatomy and physiology of the nervous system.
277	Anatomy and physiology of the nervous system.	248	General.
128	Conation and movement.	171	Conation and movement.
122	Cognition.	169	Cognition.
69	Conditions and relations of consciousness.	86	Conditions and relations of consciousness.
28	Affection.	33	Affection.
3,067		3,186	

As a helpful sign of the high level of activity in psychology one can read the indications in the record of publications to be found in the *Psychological Index for 1910* (17). That the science is "established" beyond all peradventure may be gathered from the striking steadiness of its literary output. The growth of the *Index* is approaching the limits which may result, as announced, in reducing the space given to philosophy. The total entries for 1910 were 3,186, by two thousand five hundred and fourteen authors. This total is over ten per cent. less than that of 1908, but four per cent. increase over that of 1909. Last year seven topics showed an increase, and three a decrease, in

the number of contributions. The largest gain is one hundred and thirteen on sensation, the greatest loss is ninety-five on the conditions and relations of consciousness. The slight displacement in rank shown by sleep, trance and pathology, the philosophical implications, general, and the anatomy and physiology of the nervous system, do not effect the general significance of the table above. The fact that the field of genetic, individual and social psychology has steadily held the first place during the past four years should be highly instructive to one seeking for indications of the positive directions being taken by psychological inquiry.

A more striking illustration of the enormous range of activity in the science may be found in the year's history of the *PSYCHOLOGICAL BULLETIN*. In 1911 this journal inaugurated a new and helpful plan for reporting the literature of psychology. In addition to its reports of the proceedings of four psychological congresses or annual meetings, and the special reviews, eleven issues were given to general reviews and summaries of the work of the year 1910 (including some reference to the results of 1909 and 1911). These were grouped under forty-seven topics; and while they aggregated over seven hundred references, they numbered less than one fourth the number recorded in the *Index* for the same year!

The ability of psychology to maintain its scientific and educational interests in America, at least, is shown in the annual record of the bestowal of the degree of Doctor of Philosophy by American universities which is being kept by *Science* (19). Psychology is one of the seventeen natural and exact sciences, in which two hundred and thirty-nine degrees, and one of the thirty-four subjects, in which four hundred and thirty-seven degrees were conferred in 1911. Twenty-three degrees, a number greatly above the average (15.8) for this science since 1898, were conferred upon candidates presenting dissertations on psychological subjects. Twenty of these were conferred by four universities, Clark (seven), Chicago (six), Columbia (four), and Pennsylvania (three). Psychology also continues to rank fourth among the twenty sciences, and seventh among the thirty-seven subjects which are credited with the doctorate of American universities. The same record shows that education, as a subject, was credited in 1911 with twenty-three degrees, and calls attention to the impossibility of picking out the psychology that may have crept into education, and vice versa.

During the year the channels of publication in psychology have shown interesting development. The activities of investigators in

all the clearly differentiated branches of the science are increasing rapidly. We have come to the happy state where each aspect is having its own periodical. The beginning of the year saw the appearance of *The Journal of Animal Behavior*, under the editorial direction of R. M. Yerkes and an editorial board, and its series of *The Behavior Monographs*, edited by J. B. Watson. Another sign of rapidly extending investigations is found in the two additional outlets for extensive material opened in 1911 in the *Beihefte* of the *Zeitschrift für angewandte Psychologie und psychologische Sammelforschung*, now in its fifth volume, and in the series of monograph supplements to the *British Journal of Psychology*, in its third volume. W. Specht is the editor of the new *Zeitschrift für Patho-psychologie* appearing in Munich. The new *Zeitschrift für pädagogische Psychologie und experimentelle Pädagogik*, under the editorial care of Meumann and Scheibner, is a combination to continue the interest in the fields hitherto cultivated by the older *Zeitschrift für pädagogische Psychologie* (since 1899) and the younger *Zeitschrift für experimentelle Pädagogik* (since 1905). The first volume of the institute for experimental pedagogy and psychology of the Teachers' Association of Leipzig, the *Pädagogisch-Psychologische Arbeiten*, aims to bring the achievements of experimental psychology to the acquaintance of students of education. That exact methods of inquiry in this field are beginning to receive some attention in England is shown by the new *Journal of Experimental Pedagogy and Training College Record*, edited by J. A. Green, of Sheffield University.

The associational interests of psychology continued to exercise the diverse activities of former years. The stated meetings of national, sectional and local organizations offered the usual opportunities for expressions in general, experimental, educational, comparative, and abnormal psychology. Besides these efforts, several events of unequal significance for progress may be chronicled. The Fourth International Congress of Philosophy, held at Bologna in April, devoted one of its eight sections to philosophy—an indication that the divorce of the two subjects remains to be made final. The American Psycho-analytic Association was organized at Baltimore, in May, under the presidency of J. J. Putnam, and in affiliation with the International Psycho-analytic Association. Renewed efforts to bring together the results of scientific child study led to the organization of the First International Congress of Pedagogy held at Brussels, in August, under the presidency of M. C. Schuyten. In the following month was held the international *Verein* for medical psychology and psychotherapy in Munich.

The year also brought forth a number of instances of organized efforts to further the movement of the application of psychology, particularly to education. In Berlin, teachers and psychologists united in the organization of a *Verein für pädagogisch-psychologische Statistik*, which aims to keep foremost the use of methods of investigation of a scientific character. Teachers are also to be immediate beneficiaries of psychology in the Institute for Pedagogical Psychology established in Munich under Fischer and in the Pedagogical Institute at the University of Tübingen under Deuchler, while in Breslau special study of intelligence tests is being carried on by the new committee organized for work in educational psychology. The more permanent establishment of the science and its further extension and application are evidenced in the gift of one hundred and fifty thousand marks by Professor Hans Meyer to the University of Leipzig for an institute of experimental psychology, in the fund of one hundred and twenty thousand roubles by an anonymous donor for the building and equipment of a psychological institute at the University of Moscow, and in the Gatzert Foundation for child welfare in the University and State of Washington, to direct which a psychologist, S. Smith, has been appointed. The varied services of "applied" psychology found a new direction in the appointment of a psychologist, L. R. Geissler, for special research in the physical laboratory of the National Electric Lamp Association, in Cleveland.

The deaths of Alfred Binet, of France, Sir Francis Galton and John Hughlings Jackson, of England, W. A. Nagel, of Germany, Angelo Mosso, of Italy, and Henry P. Bowditch, of America, remind us of the distinctive services in specializing problems and devising techniques for their solution which may come from physiologists and neurologists as well as from psychologists. Binet was director of the laboratory of physiological psychology at the University of Paris, founder of the *L'année psychologique*, and a special student of child psychology, whose collaboration in the tests of intelligence, familiarly known by his name, promises to be directive of numerous inquiries in the years to come. Galton's wide range of scientific interest gave to psychology a new era by his statistical methods and his approach to the problems of special traits and mental heredity. Each of the four physiologists left his impress at some point in psychology. Jackson nearly a generation ago worked out the suggestion of the widely serviceable generalization of evolutionary levels in brain function, by showing wherein higher functions become specific and the structures supporting them become more

complex. Nagel's interest as a physiologist in psychology became fixed in his contribution to the advancement of the theory of color-blindness and his devices of test-cards and apparatus for light-transmission. Mosso invented the ergograph, and largely fashioned the important field of fatigue. Bowditch advanced our knowledge of the physiology of vision and the knee-jerk, and filled with permanent suggestiveness his anthropometric work on the growth of children.

REFERENCES

1. BOBERTAG, O. *Zsch. f. angew., Psychol. u. psych. Sammelforschung*, 1911, 5, 105-203.
2. BRAUNHAUSEN, N. Eine Krisis der experimentellen Psychologie? *Arch. f. d. ges. Psych.*, 1911, 21, 4. Literaturbericht, 1-10.
3. BINET, A. and SIMON, T. Le mesure du développement de l'intelligence chez les jeunes enfants. *Bull. de la soc. libre pour l'étude psych. de l'enfant*, 1911, 11, 187-248.
4. GODDARD, H. H. Two Thousand Normal Children Measured by the Binet Measuring Scale of Intelligence. *Ped. Sem.*, 1911, 18, 232-259.
5. HAMILTON, G. V. A Study of Trial and Error Reactions in Mammals. *Jour. of Animal Behavior*, 1911, 1, 33-66.
6. HOLLINGWORTH, H. L. The Psychology of Drowsiness. *Amer. Journ. of Psychol.*, 1911, 22, 99-111.
7. KOSTYLEFF, N. *La crise de la psychologie expérimentale. Le présent et l'avenir*. Paris: Alcan, 1911. Pp. 176.
8. LADD, G. T. and WOODWORTH, R. S. *Elements of Physiological Psychology*. Thoroughly revised and re-written. New York: Scribner's Sons, 1911. Pp. 704.
9. MARGIS, P. Das Problem und die Methoden der Psychographie. *Zsch. f. angew. Psychol., etc.*, 1911, 5, 409-451.
10. MARGIS, P. *E. J. A. Hoffmann: Ein psychographische Individualanalyse*. Leipzig, 1911. *Ibid.*, Beiheft, No. 4.
11. MARTIN, L. J. The Projection Method. *PSYCHOLOGICAL BULLETIN*, 1911, 8, 36-37 (abstract).
12. MEUMANN, E. Der gegenwärtige Stand der Methodik der Intelligenzprüfungen. *Zsch. f. exper. Päd.*, 1910, 11, 68-79.
13. MICHOTTE, A. and PRÜM, E. Etude expérimentale sur le choix volontaire et ses antécédents immédiats. *Arch. de psychol.*, 1910, 10, 113 ff.
14. MYERS, C. S. *A Text-Book of Experimental Psychology, with Laboratory Exercises*. 2d ed., Pt. I. and II. New York, 1911.
15. PILLSBURY, W. B. *The Essentials of Psychology*. New York: Macmillan, 1911. Pp. 362.
16. *Psychological Clinic*, 1911, 5, 199-238.
17. *Psychological Index*, No. 17, for the Year 1910. *PSYCHOL. REV. Publ.*, 1911.
18. *Report of the Committee of the Amer. Psych. Assoc. on the Standardizing of Procedure in Experimental Tests*: PILLSBURY, W. B., SEASHORE, C. E., ANGELL, J. R. *PSYCH. REV. MON.* No. 53, Dec., 1910. *Methods of Studying Vision in Animals*, R. M. YERKES and J. B. WATSON. *Behavior Monographs*, 1911, Vol. 1, No. 2.

19. Doctorates conferred by American Universities. *Science*, 1911, 34, 193 ff.
20. SINGER, E. A., Jr. Mind as an Observable Object. *J. of Phil., Psychol., etc.*, 1911, 8, 180 ff.
21. TAWNEY, G. A. Consciousness in Psychology and Philosophy. *J. of Phil., Psychol., etc.*, 1911, 8, 197 ff.
22. THORNDIKE, E. L. *Animal Intelligence. Experimental Studies*. New York: Macmillan, 1911. Pp. 297.
23. TOULOUSE, E. and PIÉRON, H. *Technique de psychologie expérimentale*. 2d ed. 2 vols. Paris, 1911.
24. VOLD, J. M. *Ueber den Traum: Experimental-psychologische Untersuchungen*. (Posthumous.) Edited by O. KLEMM. Vol. 1. Leipzig, 1910. Pp. 435.
25. YERKES, R. M. *Introduction to Psychology*. New York: Holt & Co., 1911. Pp. 427.

HISTORICAL CONTRIBUTIONS

BY PROFESSOR I. WOODBRIDGE RILEY

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The year is signalized by two important histories of psychology. Of these Dessoir's (3) has the wider sweep, attempting to give, from direct sources, the fundamental lines of ancient and modern thought, and especially to present the advance made in the development of this discipline. The three roots of psychology are the religious,—the phenomena of dreams and death giving us occult psychosophy; the individual,—with the localization of the soul in the heart and midriff; the social,—with its linguistic and poetic implications. These three roots may be traced through classical antiquity, the temperamental school of Galen, the introspective Alexandrians to the Renaissance itself. The latter's psychognosis splits into the genetic-individual psychology of quietism and the temperamental-racial which began with Gracian and ended with Chamfort. Here the French studies are made responsible for a double development of Humanism: on the one hand arising a decadent dissection of character by Rousseau, on the other the more healthy self-portraiture of Goethe, Maine de Biran, Maurice de Guérin. This extremely interesting study of the psychology of comparative literature is succeeded by another on the ancient conception of the life of the soul. This includes the background of folk-lore, and the esoteric Orphic-Pythagorean cult as to the soul's two-fold relation to the spirit world and to physical nature. Next come the Pre-Socratics proper, Platonism as a combination of the mystical and mechanical, the Aristotelian genetic-rational views, the variants among the Epicureans, Stoics and Neo-

platonists, and the neglected opinions of the Patristics. In the Middle Ages psychology becomes a history of the activities of the soul under Roman-Germanic Christianity. After the brief career of the Arabian physiological psychology, high Scholasticism is overthrown by new empirical and mystical doctrines from Roger Bacon to Tauler. With the founding of constructive psychology under Vives and Lord Bacon there arises the connection with mathematics, utilized by Descartes, despite his adoption of the Augustinian ego, by Hobbes, and even by Malebranche in his heuristic principle of parallelism, but less successfully by Spinoza who leaves the connection between psychology and epistemology to be made clearer by Locke, by Hartley and his associationism, and by the analytics Hume, Reid, and Tetens. With Leibniz and Wolf begins the German faculty psychology. This, being criticized by Kant, eventuates in the self-determining systems of Fichte and Schelling, the vague spiritism of Hegel, and the animism of Herder. With the more exact methods of Schubert, Carus and Burdach come the opponents of the dialectical school Fries and Beneke, the eclectics Tiedemann, Reinhold and Scheidler. At this point historic proportion is lost. Ten pages are devoted to Herbart and his school while less than two are granted to the French founders Condillac, Cabanis, and Destutt de Tracy; there is an interesting paragraph on Gall but nothing on Spurzheim; in the rubric, but not in the text, Hazard and James are put among the English psychologists, and, in conclusion, but twelve pages are devoted to German psychology since 1850. The work is, however, notable for tracing the golden thread of continuity, and especially interesting in its account of the primitives in Hellenism and the Renaissance.

Klemm (4) presents a history of the problems of psychology much as Janet and Séailles have done in philosophy. Besides tracing the development of the past he attempts to define the limits of modern psychology as a separate discipline, from the point of view of a disciple of Wundt. The work ranges from the beginnings of introspection in the occult sciences to present applications in pedagogy, jurisprudence and psychiatry. Under the heads of metaphysical psychology we have spiritualism proper, and materialism in its atomic, mechanical and psychophysical varieties, and under empirical psychology the associational, comparative and experimental varieties. This first division on the common aims of psychology is followed by a second on the development of fundamental concepts such as consciousness, the contents of consciousness, psychological method,

and psychological measurements as presented by Weber, Fechner and G. E. Müller. The last division offers a highly interesting history of the most important theories regarding not only the general problems of sensations of sight and hearing, but also special problems of space, such as Müller's nativistic, Helmholtz's empirical, and Herbart's genetic hypotheses. The thoroughness of Klemm's work is evidenced in the last chapter with its theories of feeling subdivided into the phenomenal, psycho-mechanical, physiological, and psychophysical; and its theories of the will into the intellectual, absolutistic, heterogenetic, and emotional. We note, in conclusion, the names of nine American psychologists from Edwards to James.

Boutroux (1) in his beautifully written monograph, makes James an opponent both of the actualists and the substantialists, since the former are too atomistic, the latter too remote from reality. Introspection shows the reality to be rather the stream of consciousness. Here psychophysical parallelism has a new meaning because the nerve centers are to be considered partially spontaneous and intelligent. In this way the principles of science tend to become transfigured by the contact of physiology, their materialism being sublimated, their mechanism animated, their determinism rendered more supple.

Cushman (2) continues his treatment of last year's volume, commenting succinctly on the psychology of the modern philosophers from Hobbes to Herbart. To his chapter on the Enlightenment he adds, without comment, one group of associationist psychologists from Peter to Thomas Brown, and another of "associationist psychologists and related philosophers" from Kruger to Sulzer.

Lévy-Bruhl offers an appreciation of Cournot on the occasion of a reprint of his *Traité de l'enchaînement des Idées fondamentales*, which has remained almost unknown because of the original opposition of Comte and Renouvier.

REFERENCES

1. BOUTROUX, E. *William James*. Paris: Colin, 1911. Pp. 142.
2. CUSHMAN, H. E. *A Beginner's History of Philosophy*. Vol. II. New York: Houghton Mifflin Company, 1911. Pp. v + 377.
3. DESOIR, MAX. *Abriss einer Geschichte der Psychologie*. Heidelberg: Winter, 1911. Pp. viii + 272.
4. KLEMM, OTTO. *Geschichte der Psychologie*. Berlin: Teubner, 1911. Pp. x + 388.
5. LÉVY-BRUHL, L. Une réimpression de Cournot. *Rev. de mét. et de mor.*, 1911, 19, 292-295.

MIND AND BODY

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Noteworthy in the discussion of this problem during the year is a searching, but, in result, considerably diverse attempt to define mind or consciousness. Oesterreich (28), resting his case on self-observation, which, according to him, discovers a not-further-reducible "I-moment," argues that the "I" is not a complex of phenomena which singly do not contain it but is a phenomenon of a special kind. On the contrary, Gross (17), while dissatisfied with the bundle theory of consciousness, agrees with Hume that we do not actually find the self as object. Nevertheless he holds that our introspection is accompanied by the conviction that there was something-more-than-that present in the feeling-willing-judging experience than we actually have in the object of introspection. This "more-than" we express metaphorically as "center," "focus," etc. Martius (24) rejects the substance view of mind, which Schwartzkopf (29) on the contrary, and by appealing to introspection, accepts. The latter, however, attempts to substitute a living substantiality for the static substantiality of older thought. Schwartzkopf argues that I am not the mere sum of my life experiences; they belong to me as "mine." Sichler (31), on the contrary, maintains, with Wundt, the conception of the soul as pure activity, arguing that the conception of the soul as doer of its deeds or carrier of its qualities is due to the transference of the "thing" concept to the soul. "It is asked that the act be referred back to an acting subject. But the act itself is primary. The division of act and acting subject is a play with concepts of reflection, which we first distinguish as subject and object and then proceed to separate into independent realities." He holds likewise that the introspected consciousness has not the constancy requisite for the concept of substantiality. Singer (32), too, rejects the substance view, explaining it as due to the satisfaction of treating any complex thing as an additive result. Consciousness is not something to be inferred from behavior ("an eject forever veiled and hidden in a land beyond experience"); it is behavior. Or, more accurately, our belief in consciousness is an expectation of probable behavior based on an observation of actual behavior, a belief to be confirmed or refuted by more observation, as any other belief in a fact is to be tried out. Miller (26) questions the correctness of this view. Con-

sciousness, to him, appears to be a "field," or at least "the relation of conjunction between the components of the field." "It is these pools of conjoint phenomenality that Mr. Singer completely ignores." Joseph (20) objects to the prevalent psychological manner of treating the soul or mind mechanically. "I do not say that we cannot to some extent assign the conditions psychical or physical under which [thinking and knowing] occur in the individual mind. . . . But such observations do nothing to explain the process; the whole process still remains, as something which has an intelligible nature of its own, not mechanical." Cotlarciuc (10) holds the view of the soul as a bearer of its qualities. D'Istria (12) recounts the important work of Cabanis in leading French philosophy away from Condillac's view of the self. Bergson (3, 4, 5) repudiates the notion of a substantial ego. The *moi qui dure* is ceaseless change. There is no permanent substrate. Ladd (21) rejects "the distinction between the 'phenomenal ego' and the real mind, if by the former we mean the one subject to which we attribute all the characteristics of doing and suffering that make themselves known as consciousness. . . . This subject of states is the reality." Bode (7) passes in review the newer realistic conceptions of consciousness, approving them as a protest against subjectivism and transcendentalism, but discovering in them inherent weaknesses in so far as they aim to be rival doctrines. McGilvary (25) would describe consciousness not as a relation of meaning nor as a way of appropriation of past experiences, but as a "way of being felt together." Dewey (11) maintains that as long as perceptions are "regarded as cases of knowledge, the gate is opened to the idealistic interpretation." They should be conceived as pure natural events. "Knowing is something that happens to things in the natural course of their career, not the sudden introduction of a 'unique' and non-natural type of relation."

On the question of the homogeneity or heterogeneity of the physical and the psychical, Oesterreich (28) takes firm stand for the latter alternative. All attempts, he holds, to treat the psychical processes as complexes of natural processes fail. It is the "I" character of all psychical facts which places the subject-matter of psychology in complete contrast to that of the physical world. Martius (24), although differing from Oesterreich in his view of the nature of consciousness, holds similarly that consciousness is not part of the physical series. Two facts, according to him, substantiate this: the discontinuity of physical and psychical with regard to stimulus and result; the well-nigh mechanical self-sufficiency of certain chains of

psychical processes. Rejecting parallelism as contrary to introspective analysis and as requiring a mass of accessory hypotheses, and the energy theory as employing a concept too narrow to include the psychical, he describes the relation between mind and body as a teleological one, in the sense that the physical world is a means to the realization of the psychical. A teleological view is necessary, he holds, by reason of the abstract one-sidedness of the sciences and the inability of the causal series to explain themselves. Schlegel (30), on the contrary, supports the view that consciousness is a form of energy. Henry (18, 19) works out in elaborate detail a description of psychical facts in terms of energy. Franken (15) approaches the problem from the point of view of the question whether a universal psychology is possible, or whether such psychology must not in fact be merely a physiology of the nervous system. In the course of his negative answer to the latter alternative, he rejects the energy concept as inadequate to express psychological processes; he likewise rejects the identity theory, showing that it is based upon a spatial metaphor—inner and outer. He asks why reality, possessing the aspects inner and outer, might not possess innumerable others. He sees no excuse for parallelism; its fear of a causal interchange, he holds, is due to a confusion of "causality" with "energy." If causality means invariable sequence, interaction (causal relation) need not mean the intrusion of energy from the psychical into the closed world of physical energy. He concludes, holding this sole legitimate meaning of causality, that the physical and psychical are related by way of interaction. The psychical is the principle of organization or equilibrium. Psychical processes are of such a nature, always, that the result is a *total* impression, a higher unity, a kind of equilibrium. Disturbances of this unity call forth processes for the restoration of the original unity or the achievement of a new one. In this sense, the psychical (*i. e.*, the totality or equilibrium principle) is prior to the parts and teleologically related to them. Becher (2) likewise finds no incompatibility between psychophysical interaction and the principle of conservation of energy. (1) Every measurement of energy transformations fails of complete agreement with the conservation principle. This discrepancy may actually be due to the intrusion of the psychical. (2) The psychical may itself be a form of energy. (3) In so far as there are even physico-chemical influxes which bespeak no increase or diminution of energy, the same may be true of psychical influxes. Mackenzie (23) attempts to remove the difficulty by finding it unnecessary "to assume that the

amount of energy in the physical system is in any way interfered with by the presence of conscious processes. It is enough if we may suppose that its *form* is in some way affected." Cohn (9), on the other hand, rejecting both interactionism and parallelism, regards the physical and the psychical as differently characterized but in fact identical processes of the one world. Singer (32) contents himself with the view that life and consciousness are aspects of a body's behavior from which other aspects may be distinguished, but which may not be regarded as separable. Sichler (31) upholds Wundt's monistic view of body and mind, declaring however that this view was for Wundt a hypothesis solely of heuristic worth. Stout (33), announcing a radical change in his view, maintains, with the new realists, that "what is existentially present in consciousness in sense-perception is matter directly apprehended as it is in itself." Only it is and is thought as being partial and fragmentary. "For thought, it signifies its own continuation and completion in a whole which transcends and includes it." Mitchell (27) holds that consciousness and material processes imply each other with logical necessity, consciousness being the inversion or reciprocal aspect of organic activity, *i. e.*, virtual, in distinction from externalized or real, activity.

On the closely related problem of the relation of life to the bodily processes, Lovejoy (22) attempts to define three possible positions of vitalism: (1) That organisms have unique laws; (2) that these laws cannot be stated in terms of the number and arrangement of the organism's physical components; (3) that there are special forces or agents as causes of these peculiar modes of action. The presumption he holds to be in favor of (2). In any case, the hypothetical "forces" or "causes" would not constitute the basis of an irreducible minimum of vitalism. Briot (8) defends a vitalistic view of biology. Driesch (14) presents a new—a logico-metaphysical—basis for vitalism. Becher (2) shows that the conflict between mechanism and vitalism is one with the conflict between parallelism and interactionism, and holds with the latter pair of alternatives.

Differing considerably from these attempts is the attitude of "interested ignorance" of Yerkes (34). "Instead of working on the presupposition that mind causes body or that body causes mind, we may more profitably admit to ourselves that we do not know whether a causal relation exists between the two sets of phenomena. Thus we should be free to work toward a solution of the problem without the encumbrance of a philosophical system or of prejudicial assump-

tions." Yerkes, like Becher, supports "psychical causality," in so far as, to him, there is as much orderliness in mental as in physical events. "What psychology needs is more extensive and accurate information concerning the sequences of its phenomena. Too long the notion has held sway that psychical events are wayward, uncaused, etc. . . . or that their true causes are not other mental events but bodily events. This last view and no other in my opinion has so retarded the development of real psychological insight and information." Hence he advises the study of (1) the facts of consciousness in their mutual relations; (2) the facts of bodily life in their relations; (3) the correlation of the two series of events.

Becher (2) notes the tacit assumption of many scientists that causality has no place in the psychical sphere, but is present solely in the sphere of the physico-chemical. To this unwarranted assumption, he holds, is largely traceable their unwillingness to permit any manner of psychophysical interaction.

Except for Franken's (15) rather obscure view of the psychical as "equilibrium principle," the one view which departs in a marked manner from the conventional modes of treatment of the problem is that of Bergson (3, 4, 5, 6). The novelty of his view is due to his thought of perception as a means, not to knowledge, but to action. Hence the initial separation ordinarily made between a subjective knower and an objective known is not permitted. Perceptual activity is essentially the activity of an object in and with the world of objects. It differs from other activity solely in degree. All life is reactive. Perceptive life is distinguished simply by a greater power to postpone reaction and by a larger range of reactive possibilities. Matter is the totality of images; perception is a selection from matter, a selection necessitated by motor needs. The reactive organism cannot respond to the total world; its selected world of response therefore is matter transformed into perception. Perception, in this sense, is not a "looking at" a world outside; it is simply a selective mode of activity in and upon the world. "Whereas matter is the whole sum of images, such portions of the latter as are related to the possible actions of my body constitute perception, which is then a selected portion of matter."

Such selective activity, which divides the world into mutually exclusive images, Bergson regards as due to the arrest of the vital impulse. "Matter is . . . an inverse motion which runs counter to the vital impulse, or, what is declared to be the same thing, an interruption of the latter. The creation of matter is a simple arrest of

the action which generates life, just as an interruption of the act of creating a poem spreads it out into sentences and words. As a result we have matter and intellect, always correlatives, which thus are both a checking of the vital impulse, a constrained pause in its spontaneous flow. The tension of duration is relieved, and quality becomes quantity" (13). "Apparently," says Dolson, "not only is the inverse motion equally primitive with that which it opposes, but matter and intellect, though neither is founded upon the other, yet become progressively so adapted to each other, that they sometimes seem like different aspects of the same thing." In his Birmingham address, Bergson casts further light upon the function of matter: "When setting one against the other, we examine consciousness and matter in their mutual reactions, we have the impression that matter plays at first the part of an instrument that cuts it up in order to bring about a greater precision. A thought only becomes precise when it is divided into words"—a process which costs effort. "Now this effort would not have been put forth without matter, which by the unique nature of the persistence it opposes and the unique nature of the docility to which it can be brought, plays at one and the same time the rôle of obstacle and stimulus, causes us to feel our force and also to succeed in intensifying it." Finally he relates consciousness and matter to duration as follows: "Sensation, which is the point at which consciousness touches matter, is . . . the condensation . . . of a history which in itself—in the world of matter—is something infinitely diluted and which occupies enormous periods of what might be called the duration of things. On the one hand, matter subject to necessity, a kind of immense machine, without memory, or at least having only just sufficient memory to bridge the interval between one instant and the next, each of the states of the material world being capable, or almost so, of mathematical deduction from the preceding state, and consequently adding nothing thereto; on the other hand consciousness—that is to say, on the contrary, a force essentially free and essentially memory, a force whose very character is to pile up the past on the past, like a rolling snowball, and at every instant of duration to organize with this past something new which is a real creation. That these two forms of existence, matter and consciousness, have indeed a common origin, seems to me probable. I believe that the first is a reversal of the second, that while consciousness is action that continually creates and multiplies, matter is action which continually unmakes itself and wears out." The view stated in the last sentence is one developed with some poetic power by Auerbach (1).

REFERENCES

1. AUERBACH, F. *Ektropismus oder die physikalische Theorie des Lebens*. Leipzig: Engelmann, 1910. Pp. v + 99.
2. BECHER, E. *Gehirn und Seele*. Heidelberg: Winter, 1911. Pp. xiii + 405.
3. BERGSON, H. *Time and Free Will: An Essay on the Immediate Data of Consciousness*. Authorized translation by F. L. Pogson. London: Swan Sonnenschein; New York: Macmillan, 1910. Pp. v + 252.
4. BERGSON, H. *Creative Evolution*. Authorized translation by Arthur Mitchell. New York: Holt, 1911. Pp. xv + 407.
5. BERGSON, H. *Matter and Memory*. Authorized translation by N. M. Paul and W. S. Palmer. London: Swan Sonnenschein; New York: Macmillan, 1911. Pp. xx + 339.
6. BERGSON, H. Life and Consciousness: The "Huxley Lecture" delivered at the University of Birmingham, May 29, 1911. *Hibbert Journal*, 1911, 10, 24-44.
7. BODE, B. H. Realistic Conceptions of Consciousness. *Phil. Rev.*, 1911, 20, 265-279.
8. BRIOT, A. Le problème de l'origine de la vie. *Rev. de phil.*, 1910, 17, 250-270.
9. COHN, M. *Ueber das Denken. Zusammenhang des Geistes und Körpers*. Eine Studie. Berlin: L. Simion, Nachf., 1910. Pp. iv + 140.
10. COTLARCIUC, N. *Das Problem der immateriellen geistigen Seelensubstanz*. (Studien zur Philosophie und Religion; 6te Heft.) Paderborn: Schöningh, 1910. Pp. xi + 266.
11. DEWEY, J. Brief Studies in Realism. *J. of Phil., Psychol., etc.*, 1911, 8, 393-400; 546-554.
12. D'ISTRIA, F. C. Cabanis et les origines de la vie psychologique. *Rev. de mét. et de mor.*, 1911, 19, 177-198.
13. DOLSON, G. N. The Philosophy of Henri Bergson. *Phil. Rev.*, 1910, 19, 579-596; 1911, 20, 46-58.
14. DRIESCH, H. *Zwei Vorträge zur Naturphilosophie*. I. *Die logische Rechtfertigung der Lehre von der Eigengesetzlichkeit des Belebten*. II. *Ueber Aufgabe und Begriff der Naturphilosophie*. Leipzig: Engelmann, 1910. Pp. iii + 38.
15. FRANKEN, A. Möglichkeit und Grundlagen einer allgemeinen Psychologie, im besonderen der Tierpsychologie. *Zsch. f. Phil. u. Päd.*, 1910, 17, 313-325; 361-374; 425-448; 489-502; 538-549.
16. GAULTIER, P. *La pensée contemporaine: les grandes problèmes*. (La vie intérieure.) Paris: Hachette et Cie, 1911. Pp. 62-92.
17. GROOS, K. Bemerkungen zum Problem der Selbstbeobachtung. *Zsch. f. Phil. u. ph. Kr.*, 1910, 137, 76-81.
18. HENRY, C. Psycho-physique et énergétique. *Bull. inst. gén. psychol.*, 1909, 9, 3-25.
19. HENRY, C. Psycho-biologie et énergétique. *Bull. inst. gén. psychol.*, 1909, 9, 25-236; 317-319.
20. JOSEPH, H. W. B. The Psychological Explanation of the Development of the Perception of External Objects (III.). (Reply to Prof. Stout.) *Mind*, 1911, 78, 161-180.
21. LADD, G. T. The Ontological Problem of Psychology. *Phil. Rev.*, 1911, 20, 363-385.
22. LOVEJOY, A. O. The Meaning of Vitalism. *Science*, 1911, 33, 610-614.
23. MACKENZIE, J. S. Mind and Body. *Mind*, 1911, 80, 489-506.

24. MARTIUS, G. *Leib und Seele*. Kiel: Lipsius und Tischer, 1910. Pp. 26.
25. MCGILVARY, E. B. Experience as Pure and Consciousness as Meaning. *J. of Phil., Psychol., etc.*, 1911, 8, 511-525.
26. MILLER, D. S. Is Consciousness "a Type of Behavior"? *J. of Phil., Psychol., etc.*, 1911, 8, 322-327.
27. MITCHELL, A. The Logical Implication of Matter in the Definition of Consciousness. *J. of Phil., Psychol., etc.*, 1911, 8, 561-565.
28. OESTERREICH, K. *Die Phänomenologie des Ich in ihrer Grundproblemen*. Leipzig: Barth, 1910. Pp. vii + 532.
29. SCHWARTZKOPF, Prof. Dr. Ist die Seele eine Substanz? *Zsch. f. Phil. und ph. Kr.*, 1909, 134, 88-102.
30. SCHLEGEL, E. Energetik und Bewusstsein. *Ann. der Naturphil.*, 1911, 10, 415-436.
31. SICHLER, A. Ueber falsche Interpretation des kritischen Realismus und Voluntarismus Wundts. *Arch. f. syst. Phil.*, 1911, 17, 1-43.
32. SINGER, E. A., Jr. Mind as an Observable Object. *J. of Phil., Psychol., etc.*, 1911, 8, 180-186.
33. STOUT, G. F. Reply to Mr. Joseph. *Mind*, 1911, N. S. 77, 1-14.
34. YERKES, R. M. *Introduction to Psychology*. New York: Holt, 1911. Pp. xii + 427.

CONSCIOUSNESS AND THE UNCONSCIOUS

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Of recent books dealing with the problems of consciousness those by the following authors may be noted. McCabe (16) attempts to synthesize data from a group of related sciences in such a way as to give a history of the development of mind. Consciousness is not present everywhere in the animal series, but first appears when a certain degree of nervous complexity is reached, surely in the mammal, perhaps before. As to the exact moment of its appearance, all proposed criteria are inadequate; the answer must be deferred until we know more of the nervous system than at present.

Fite, in his "Individualism" (8), sets an ethical problem which requires for its solution a theory of consciousness. For the author, the true nature of consciousness is unity in diversity. From the mechanical point of view, the universe shows irreconcilable oppositions, which it is the function of consciousness to resolve through higher syntheses. Just in proportion as action is fully conscious, it harmonizes opposing phases of experience. The relation between the self and the object is always present in consciousness, self- and object-consciousness developing together in the individual.

Oesterreich (23) postulates the existence of a permanent ego as

the principle of unity of conscious contents. The opposition between the self and the object is always given in experience. Feelings form a truer groundwork for personality than do the organic sensations. Various abnormal phenomena are discussed, and the ego is shown to be permanent amid all pathological changes of personality.

Titchener (30) rejects the definition of consciousness as "the mind's awareness of its own processes." For him, it is the "sum-total of mental processes occurring *now*, at any given present time."

Miss Calkins (4), defining psychology as "the science of the self as conscious," holds that "in being conscious, I am always conscious (even if vaguely conscious), of myself as related either to an object or to that totality of objects which I call my environment."

Recent papers dealing with consciousness approach the subject from both psychological and philosophical points of view. For the psychologists, Judd (13) argues that an adequate explanation of human life in biological terms, without use of the concept consciousness, is impossible. Consciousness has "solved the age-long opposition between individual and environment," by literally "taking up the environment into the individual and there remoulding the absorbed environment in conformity to individual needs." The individual thus comes ultimately to live in an inner world with laws of combination differing wholly from those of the outer world.

Weyer (32) thinks that psychology needs a unit concept more psychical than that of the physiological reflex arc. The essential characteristic of consciousness is found in "complexity, differentiated in clearness as opposed to sensory intensity." For Pikler (27), consciousness arises from purely objective and physical tendencies to repetition. It first appears as the result of resistances aroused by the excitation of opposed tendencies of such a nature. Abolition of resistances between related systems forms the higher levels of consciousness, which give rise to voluntary action. Dodge (7) regards consciousness as a form of organization, to which the concept of apperception in Erdmann's sense is the key. It thus shows the same sort of organization as its contents.

The experimental study of Ordahl (25) finds both conscious and unconscious factors involved in learning. Associations are fixed and variations crop out unconsciously, consciousness being a "corrective agent." While learning is possible when neither the end nor the fact of learning is conscious, attention gives more marked results. Experiments undertaken to determine whether material present but not conscious was more easily learned later proved inconclusive.

A group of papers deal with special phases of the question. Müller-Freienfels (21) discusses states of consciousness of heightened intensity. He finds them characterized by alterations of the emotive life, and, on the intellectual side, by increased clearness, with a telescoping of the "transitive parts." Levy-Suhl (14) makes the *Einstellung* a general capacity of all organized matter, and points out its importance both in normal and abnormal consciousness. Oesterreich (24) distinguishes three phases of disturbance of function of consciousness, depersonalization, successive alterations of self-consciousness, and splitting of consciousness.

Three papers deal with consciousness under anesthesia. Hill (10) finds the waning of consciousness under chloroform characterized by no sharply marked stages, motor ability being the last to leave, the affective state, pleasant. On recovery, sensory phenomena and emotional tone were reversed, and there was later amnesia for a partially rational period. Walker (31) notes especially a sense of loss of individuality at the beginning of recovery from ether. Jacobson (11), from an experience with nitrous oxide, concludes that higher functions may remain when lower have gone, and that subsequent amnesia may not mean unconsciousness in the patient at the time of operation. The suggestion to remember might be effective here.

Of the philosophical writers, Bawden (2) regards mental phenomena as "vicarious substitutes for physical phenomena when the latter are for any reason inadequate." Mind is but "the machinery by which the content of experience undergoes metamorphosis into a different mode." Behavior is here central.

Bode (3) criticizes the definitions of consciousness offered by the realistic movement. The instrumentalism of Professor Dewey, postulating that consciousness is merely "a name for 'sensations,' 'states of consciousness' or 'psychic elements' which emerge as the results or products of the psychological investigation," with no proper existence elsewhere, offers at least a working program.

Tawney (29) argues that functional psychology has failed to bridge the gap, created by modern science and philosophy, between inner and outer experience. Woodworth's definition of consciousness as relation seems promising. A psychology based on "immediate values" is needed.

McGilvary (18), while expressing his sympathy with relational theories of consciousness, considers that the peculiar sort of relation which constitutes consciousness is neither to be found in the appropriation by the present of past experience, as James would hold, nor

in the meaning relation assumed by Woodbridge. Consciousness, while relational in character, is characterized by "a unique way of togetherness, distinct from all other ways of togetherness," which "must be taken at its face value, neither less nor more." His other paper (17) is a protest against Dewey's identification of consciousness with the "organic releases . . . which are the conditions of awareness." Such a position is hardly distinguishable from that of the realists, and still leaves untouched the whole problem of consciousness.

Miller (19) criticizes Singer's statement that "consciousness is not something inferred from behavior, it is behavior." Consciousness implies a peculiar conjunction of objects in its field at any moment, a sort of togetherness which the realist ignores. Mitchell (20) considers that consciousness and matter imply one another as truly as convexity and concavity. The argument directed against parallelism and based on the denial of such implication thus loses its force.

Recent literature in the field of the "unconscious" or "subconscious" has at least served to emphasize the existing confusion. The earlier symposium on this topic in the *Journal of Abnormal Psychology* appears in book form (22). The article by Hart (9) which is added to the former symposium, distinguishes between marginal, co-conscious, subconscious in the sense of Janet, and the conceptual explanatory construction of Freud. Whether the facts are interpreted in mental or physical terms is of small consequence; the conception of the subconscious itself has the same pragmatic justification as the ether of the physicist.

Abramowski (1), as the result of an experimental study, argues for a subconscious which is a creative stratum, showing various degrees of organization, and the content of which tends either to enter or to recede from consciousness. Patini (26) attempts another classification of observed facts. Consciousness involves awareness of self. The apsyche are twilight states without this criterion. The unconscious is inactive and latent; the subconscious, active, but subliminal. Mackenzie (15) points out the possibility of other interpretations of the facts observed in the Beauchamp case. Chase (5) summarizes critically Freud's theories of the unconscious.

A symposium on the subject at the Geneva conference was opened by Dessoir (6), who would make the subconscious differ from consciousness, not in content, but in a less close organization of its elements. There is no water-tight compartment between the two, the marginal zone being of especial significance in phenomena of dissociation. Janet (12) again expresses his desire to limit the use

of the term "subconscious" to split-off systems which function in diseases of personality. Prince (28) regards the unconscious as inactive memory-dispositions. Co-consciousness is preferred as a term for active processes outside of consciousness. The Freudian conception of the mechanism of the unconscious is criticized in that psychoanalysis shows origins and not actual mechanisms.

REFERENCES

1. ABRAMOWSKI, E. Dissociation et transformation du subconscient normal. *Rev. psychol.*, 1910, 3, 63-80, 187-209.
2. BAWDEN, H. H. Mind as a Category of Science. *PSYCHOLOGICAL BULLETIN*, 1910, 7, 221-225.
3. BODE, B. H. Realistic Conceptions of Consciousness. *Phil. Rev.*, 1911, 20, 265-279.
4. CALKINS, M. W. *A First Book in Psychology*. New York: Macmillan, 1910. Pp. viii + 419.
5. CHASE, H. W. Psychoanalysis and the Unconscious. *Ped. Sem.*, 1910, 17, 281-327.
6. DESOIR, MAX. Das Unterbewusstsein. *Proc. VI^{me} Cong. Int. de Psychol., tenu à Genève*, 1909. Geneva, 1910, 37-56.
7. DODGE, R. A Working Hypothesis for Inner Psychophysics. *PSYCHOL. REV.*, 1911, 18, 167-185.
8. FITE, W. *Individualism*. New York: Longmans, 1911. Pp. viii + 301.
9. HART, B. The Conception of the Subconscious. *J. of Abnorm. Psychol.*, 1910, 4, 351-371.
10. HILL, Prof. and Mrs. D. S. The Loss and Recovery of Consciousness under Anesthesia. *PSYCHOLOGICAL BULLETIN*, 1910, 7, 77-83.
11. JACOBSON, E. Consciousness under Anesthetics. *Amer. J. of Psychol.*, 1911, 22, 334-345.
12. JANET, P. Les Problèmes du Subconscient. *Proc. VI^{me} Cong. Int. de Psychol., tenu à Genève*, 1909. Geneva, 1910, 57-70.
13. JUDD, C. H. Evolution and Consciousness. *PSYCHOL. REV.*, 1910, 17, 77-97.
14. LEVY-SUHL, M. Ueber Einstellungsvorgänge in normalen und anormalen Seelenzuständen. *Zsch. f. Psychother. u. med. Psychol.*, 1910, 2, 141-164.
15. MACKENZIE, W. L. Observations on the Case of Sally Beauchamp. *Mind*, 1910, 19, 1-29.
16. McCABE, J. *The Evolution of Mind*. London: Black, 1910. Pp. xvii + 287.
17. MCGILVARY, E. Prof. Dewey's "Action of Consciousness." *J. of Phil., Psychol., etc.*, 1911, 8, 458-460.
18. MCGILVARY, E. Experience as Pure and Consciousness as Meaning. *J. of Phil., Psychol., etc.*, 1911, 8, 511-525.
19. MILLER, D. S. Is Consciousness a Type of Behavior? *J. of Phil., Psychol., etc.*, 1911, 8, 322-327.
20. MITCHELL, C. The Logical Implication of Matter in the Definition of Consciousness. *J. of Phil., Psychol., etc.*, 1911, 8, 561-565.
21. MÜLLER-FREIENFELS, R. Zur Psychologie der Erregungs- und Rauschzustände. *Zsch. f. Sinnesphysiol.*, 1910, 57, 161-194.

22. MÜNSTERBERG, H., RIBOT, P., JASTROW, J., HART, B., PRINCE, M. *Subconscious Phenomena*. Boston: Badger, 1910. Pp. 141.
23. OESTERREICH, K. *Die Phänomenologie des Ich in ihren Grundproblemen*. Leipzig, 1910.
24. OESTERREICH, K. Das Selbstbewusstsein und seine Störungen. *Zsch. f. Psychother. u. med. Psychol.*, 1910, 2.
25. ORDAHL, L. E. Consciousness in Relation to Learning. *Amer. J. of Psychol.*, 1911, 22, 159-213.
26. PATINI, E. Coscienza, Subcoscienza, Incoscienza, ed Apsychia. *Riv. di psicol. appl.*, 1910, 6, 24-45.
27. PIKLER, J. *Die Stelle des Bewusstseins in der Natur*. Leipzig: Barth, 1910. Pp. 34.
28. PRINCE, M. The Subconscious. *Proc. VI^{me} Cong. Int. de Psychol. tenu à Genève*, 1909. Geneva, 1910, 71-97.
29. TAWNEY, G. A. Consciousness in Psychology and Philosophy. *J. of Phil., Psychol., etc.*, 1911, 8, 197-203.
30. TITCHENER, E. B. *A Text-Book of Psychology*. New York: Macmillan, 1910. Pp. ix + 558.
31. WALKER, H. Record of an Experience while under the Influence of Ether. *J. of Phil., Psychol., etc.*, 1910, 7, 437.
32. WEYER, E. M. A Unit Concept of Consciousness. *PSYCHOL. REV.*, 1910, 17, 301-318.

THE SELF IN RECENT PSYCHOLOGY

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Professor Titchener has made a notable contribution (3) to the discussion of the self in psychology by collecting from thirteen graduate students, all of them "trained in introspection" and six of them with "unusually thorough training," answers to the following questions:

I. "I am always inattentively or attentively conscious of myself.' . . . Is this statement true, as a matter of experience, (a) in everyday life, (b) in the introspective exercises of the laboratory?" (p. 542).

II. A question calling for a description of self-consciousness made "as definite as possible" (p. 545).

III. A question addressed only to those who had answered I. (a) in the negative, pointing out "that this answer implies that self-consciousness is intermittent. Under what circumstances, then, is it likely to appear?" (p. 548).

In reply to the first question, *two* of Titchener's thirteen subjects assert, but "with qualification" that they are always conscious of

self, the "center of material, psychical, social relations" as one of them calls it. *Four* declare that they are conscious of self during laboratory introspection. *All* assert or imply that they are sometimes conscious of self. The descriptions of self-consciousness called for by question II. are summarized in the following rough list:

"Organic complexes, 12. Visual imagery, 10. Affective processes, 8 (implied in 4 other cases). Kinæsthetic complexes, 8 (probably in other cases merged in organic). Conscious attitudes, 4 (those of responsibility, recognition of ownership of introspections, ownership of experience, and activity in the background of consciousness" (p. 551, slightly condensed).

The "one outstanding result" of the answers to question III. is "that the experience of self is preponderantly a social matter. . . . Next in order comes the unusual or novel situation" (p. 551).

From the answers to question I. Titchener concludes that "self-consciousness is, in many cases, an intermittent and even a rare experience" (p. 550); and he explains the persistence of self-consciousness in the four cases by "the hypothesis of individual difference." With the fairness which characterizes his entire discussion, he none the less admits that "it is possible that the two groups of observers [those who assert and those who deny the persistence of the consciousness of self] may have understood the question differently and are therefore talking of different things." My own reading of the records—which is colored, of course, by previous conclusions precisely opposed to Titchener's—is that the two groups of observers have indeed understood the question differently and that those who answer in the negative deny the persistence, not of self-consciousness as such but of some particular stage or phase of it. The study of the records of introspection seems to me to bear out this conclusion. It is to be regretted that five of the eleven who answered I. (a) in the negative and three of the nine who answered I. (b) in the negative neglect to supplement their bare "No" by any introspective detail. From the remaining records I quote the following indications of what seems to me a misapprehension of the meaning of self-consciousness:

"Btm. 'No. In seeing a play I am often another person, portrayed by the actor, and do not realize that I am a spectator until my neighbor speaks'" (p. 542, end).

But self-consciousness is surely present when a man seems to himself "a person" even though "another person." B. is unconscious, in the experience which he describes, of circumstances, of surroundings, of the past, but not of self.

In the following case, that of an observer who changes an origi-

nally affirmative to a negative reply, the consciousness of self is evidently confused with what is merely a common constituent of it:

"Am. 'No. . . . Self-consciousness carried kinæsthetically with possible visual images occurs comparatively seldom'" (p. 544).

But the answers to question II. have made clear that self-consciousness need not always include kinæsthetic and visual imagery.

The other negative experiences are, to say the least, entirely compatible with the hypothesis that those who deny the persistence of self-consciousness confuse "self" with some prominent aspect of it. I am unquestionably more attentively conscious of myself in novel situations and in social relations than in perception and in thought. In fact, the very word "self-consciousness" very commonly means "embarrassment" or "shyness." Thus, these observers when they deny self-consciousness except in experiences of "shame," of "being watched," of "appearing before some personage of importance" may well have overlooked the ever-present self-consciousness precisely because, being always present, it does not draw or hold their attention.

Every psychologist should read for himself these records of introspection with Mr. Titchener's discussion of them.

It would probably be unreasonable to demand that every one of us should read entire two German works, issued late in 1910, which consider, critically and historically, the psychological doctrine of the self. And yet each of them well repays study. In the first of these (1), Dr. Kafka examines contemporary conceptions of the *I* under three headings, "metaphysical," "empirical," and "epistemological" conceptions. He treats Bergmann and Drews as representatives of writers of the first type and Rickert as upholder of the empirical theory. The empirical group is subdivided; Spir and Busse are named as examples of the intellectualistic tendency, Wundt and Münsterberg as voluntarists, Lipps as emotionalist, James and Avenarius as holding the sensationalistic empirical conception, and finally Schubert-Solden and Schuppe as teaching that by "*I*" is meant merely the total content of consciousness. The possibility of such a classification is, of course, open to some question. Kafka himself indicates, in the course of his careful analysis, that Münsterberg, though a voluntarist, does not treat the *I* as content, that Lipps recognizes a real as well as an empirical self, and that James tends sometimes to an epistemological and sometimes to a voluntaristic theory.

Kafka criticizes in great detail the views which he summarizes

under all these heads, and reaches the following results: (1) The conception of the *I* as substance behind phenomena is meaningless; and the arguments adduced for the conception are either invalid or else they establish the existence of an *I* of a different sort. (2) Most "empirical" theories agree in regarding the *I* as content of consciousness (*Bewusstseinsinhalt*) either complete or partial. Theories, whether intellectualistic, voluntaristic, emotionalistic, or sensation-alistic, which conceive the *I* as partial content must, one and all, be rejected on the ground that no one of them justifies the conclusion that volitions, feelings or sensations are to be "distinguished from the other psychic phenomena" (p. 109) as constituting the self. It is equally impossible, Kafka continues, to regard the *I* as total content (*Gesamtbewusstseinsinhalt*)—and for two reasons. In the first place, such a hypothesis leaves unaccounted for the contrast actually made between *I* and *not-I*. And, second, the very existence of a content presupposes the existence of that-of-which-it-is-content, and the experienced (*das Erlebniss*) must be experienced (*erlebt*) by some subject (p. 233). But the *I*, or subject, is that whose nature we are discussing. It would be meaningless to call it both subject and object for that would be to do violence to its unity. Or, to paraphrase another of Kafka's statements of this difficulty, the content of consciousness is related to its subject, and neither term of a relation can be identical with the other term or with the relation (p. 234 *et al.*). Thus, Kafka reaches the epistemological, or Kantian, conception of an *I* which is subject, not object, of consciousness, which is not "found" or "experienced" but which must be assumed to exist as "necessary common point of relation of all contents combined in the unity of one consciousness" (p. 233). Such an *I*, Kafka says, is perfectly empty, has no predicates, is, indeed, mere relation. To this conclusion, it must be added, Kafka does not himself consistently hold, for in many passages he attributes to the *I* the character of being unique as well as that of being relation (pp. 225, 233 *et al.*).

The difficulties of this conception are obvious. How can one insist that it is necessary to assert the existence not of the merely unexperienced but of that which it is logically impossible to experience? If consciousness-as-content exists and if a content can exist only as content of a subject, or *I* (and Kafka makes both these assertions), then the experiencing self must exist by the same right as the experienced content.

Not merely a solution but an explanation of the origin of this problem of subject-objectivity—the problem which Kafka, as has

been indicated, vainly tries to solve by the Kantian expedient—is offered in Oesterreich's volume (2). Part II. of this book¹ is a detailed study of cases of dissociated personality, and concludes that in all these cases the essential unity of the self remains unaffected. Part I. embodies a careful study, comparable with that of Kafka, of the fundamental problem of the nature of the self. Oesterreich's definition of the *I* as "that whose states are the feelings and which in each of us remains ever identical with itself" (p. 8) suggests both the weakness and the strength of his theory. In so far as he conceives the *I* as preëminently or exclusively an emotional *I*, he lays himself open to Kafka's criticism, already summarized, of emotionalistic empiricists—in other words, he shows no adequate reason why the *I* should be described as an emotional, and not also as a thinking and a willing self. But more to be noted than this inadequacy in his doctrine is Oesterreich's teaching that the *I* is directly experienced, not as a substance behind phenomena nor as a mere, abstract "content"—sensation or thought, emotion or volition, or all combined—but as a feeling, willing, perceiving and thinking *I*. Kafka's logical difficulty—that the *I* as subject is related to its content or object and therefore distinct from it—is traced by Oesterreich to the unjustifiable effort to apply the subject-object categories to an experience wholly fundamental to them.

Oesterreich, like Kafka, is to be commended for the thorough and careful way in which he sets forth the views of other psychologists. His exposition and criticism is less systematic, but he quotes where Kafka cites and summarizes, referring to a greater number but treating only a few in detail. Neither author takes adequate account of the contributions by English and American writers to the discussion of their problem.

My present concern being with psychology, I pass over certain recent philosophical discussions of the self and close with the mention of the early chapters of Yerkes's recently issued *Introduction to Psychology* (4). They are well worth reading by teachers of psychology for their vigorous suggestion of points of view and of methods. In my opinion, they are written from the standpoint of an implicit "self-psychology." "Each one of us," Professor Yerkes says, "must start in his study of consciousness by looking inward, by observing the self" (p. 15).

¹ A more extended review of the book, by the writer of this notice, appears in the *Philosophical Review*, 1911, 20, 636-641.

REFERENCES

1. KAFKA, G. Versuch einer kritischen Darstellung der neueren Anschauungen über das Ichproblem. *Arch. f. d. ges. Psychol.*, 1910, 19, 1-241.
2. OESTERREICH, K. *Die Phänomenologie des Ich.* Leipzig, 1910. Pp. 532.
3. TITCHENER, E. B. A Note of the Consciousness of Self. *Amer. J. of Psychol.*, 1911, 22, 540-552.
4. YERKES, R. M. *Introduction to Psychology.* New York, 1911. Pp. 427.

ANALYSES OF SOME OF THE HIGHER THOUGHT PROCESSES

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Notwithstanding the fact that a few psychologists still regard any attempt to determine the psychic factors involved in such complex processes as behavior and thought as a kind of useless mental gymnastic and the result of such analyses as a sort of "introspective mythology," interest in the psychology of the higher thought processes has continued to increase during the year. In fact the studies made have contributed very materially to the belief, already held by some, that these studies are making an epoch in psychological history and mark a turning point in our psychological interests and methods.

The studies published during the year range all the way from those which attempt to determine the psychic factors involved in such mental processes as conscious attitudes, belief and doubt, meaning and understanding, and the process of abstraction on the one hand, and such complex tasks as determining the psychological processes involved in learning to shoot with a rifle on the other (4), it being suggested by the author of the latter study that a complete psychological history of the learning process involved in becoming an expert marksman was necessary to make the training of the soldier rational and economic. These studies are all interesting and important not merely because of the specific results obtained, but because of the bearing which these results have on current psychological discussions and because of the problems and refinements of method which they suggest. Not all of the studies published during the year can be mentioned or reviewed.

Okabe (6) tried to analyze and describe in analytic terms the belief and doubt consciousness, or certainty and uncertainty experience. He presented to experienced observers statements calculated

to arouse belief or disbelief in their validity and "upon the appearance of either type of consciousness the observers closed their eyes and dictated to the experimenter a full account of the consciousness." Single sentences and mathematical expressions were first presented, then sentences arranged for comparison. A summary account of the observers' reports was afterwards submitted to each subject for correction and verification. Many of the conditions under which belief and disbelief arose in consciousness were thus determined. It was found that belief might occur "in terms of a general kinæsthetic attitude, as internal speech and localized kinæsthesia, or as the result of the mental relations of visual images. It might also be bound up with, or incorporated in, a particular consciousness, verbal or visual." "Like intention, assurance, and volition, belief may be bound up with, incorporated in, a sequence of mental processes which proceed under determination, though there is nothing specific in these processes to serve as a vehicle of that meaning. These processes go on in a certain way, under the instructions given, and their going on in that way constitutes them will, recognition or belief." It would have been interesting to determine by a genetic method of observation just how such conscious patterns were actually formed or developed, a procedure which might have thrown much light on the nature and present constitution of the belief consciousness, but this was not done. The author also concludes that the belief-disbelief consciousness is not of common occurrence in everyday life and that it is not necessarily or regularly an emotional consciousness.

Jacobson (3) tried to analyze the consciousness involved in the perception of single letters and the understanding of words and sentences. From his results it appears that meaning is chiefly carried by representative processes, *i. e.*, processes representative of the content of the sentences or words. When these appeared, the sentences or words at once had a meaning, though the meaning sometimes arose when these representative processes seemed to be absent. The meaning tendency does not, however, always rise promptly in consciousness. A word or sentence may be perceived without it and different meanings may be attached to the same objective stimulus. The particular meanings actually attached to his words and sentences were psychological rather than logical. They were in general "partial meanings, particular exemplifications, or what not, touched off under the given instruction by the habit or momentary disposition of the observer." "The same stimulus-sentence gave rise to different

meanings for the same observer so that it was not enough for him to say that he understood it; he must be asked to specify precisely what he understood."

Moore (5) attempted to determine experimentally the mental processes involved in abstraction. He sought to discover how general ideas actually formed and developed in a given case. His method consisted of presenting to his subjects a series of geometrical figures so drawn and arranged that a common element constantly recurred in each group of figures while the other figures of the group were constantly varied. As soon as the common element was discovered the exposure apparatus was stopped and the subject required, on the basis of his introspective analysis, to state how the common element in the group had been isolated and perceived. He tried by this means to determine: (1) How the group of figures containing the common element was actually broken up and the common element selected; (2) how the process of perceiving or apprehending the common element actually took place; (3) how it was held in mind until recognized as having occurred before; (4) how this state of cognitive certainty was formed or developed. The analyses of these several steps were not, however, carried to the point of detailed certainty because of failure to make the observations sufficiently detailed and directed. Perhaps the most significant conclusion arrived at in the study is that the final recognition of the common element depended upon appropriate mental categories which represented compound psychical processes entirely distinct and different from imaginal processes or feelings. These mental categories were acquired through the past experience of the subjects and were aroused in this case by the sensations set up by the common element. The fact that these mental categories were not more minutely and carefully observed and described and their true nature or constitution determined, keeps the study from making an important contribution to the psychology of imageless thought. So far as the author's analyses go they support the contention that non-imaginal processes exist.

Two studies on Conscious Attitudes have appeared. Miss Clarke (2) sought to arouse conscious situations in which various attitudes would be likely to become operative. Single letters, written in blind point style, were given to her subjects to be perceived tactually and the observers instructed "to give complete introspections." The time required to recognize the letters was taken but no use was made of this reaction time in the treatment of results. A list of all the attitudes noted by the observers is given and each attitude briefly

described. The attitudes which often recurred in the course of the experiment, surprise, uncertainty, hesitation, doubt, etc., were analyzed in detail. A few attitudes recurred often enough to enable the experimenter to determine, in part, their development or genetic history from the observers' introspective accounts. Woodworth's method of studying the relational consciousness was repeated, in part, with the result that all the relational processes observed by Miss Clarke's subjects were carried in imaginal terms. Her results did not fit Woodworth's four ways of perceiving relations. His fourth class, where "the relation was present in consciousness but not analyzable into sensory or affective terms" was not paralleled. Miss Clarke, therefore, concludes, on the basis of the attitudes described in her experiments, which she believes to be fairly representative, "that all conscious attitudes can be analyzed into sensations, images and feelings, or traced genetically to such analyzable complexes; that the conscious attitudes do not warrant the assumption of an additional conscious element."

The most suggestive section of the study is the part dealing with the genesis and development of these attitudes. "The introspections of any one observer show," she says, "different stages of clearness and intensity of imagery, which allow us to connect, by graded series of intermediate steps, a complex of vivid and explicit imagery with a vague and condensed consciousness which we suppose to represent what is called imageless thought." A number of attitudes were shown to be capable of actual development, by a process of change through mechanization, ranging from states which were clearly complex and rich in imagery to a state of vague and condensed consciousness, reached by a dropping out of the former imaginal content.

Her conclusions, therefore, verify the results and conclusions reached by Book in his study of the "Genesis and Development of Conscious Attitudes" reported some four months before (1). He showed, by tracing the development of certain specific attitudes in the same mind, that the attitudes developed in his experiments were in reality the developed form of certain specific imaginal processes present in earlier stages of his experiment; that the specific attitudes which guided the fingers and hands in manipulating a typewriter in the expert stages of skill were in reality the developed forms of certain clear and definite imaginal processes used to guide the fingers and hands in the earlier stages of the learning. Every step or stage in this process was here followed in the same mind and the develop-

ment traced from a stage of vivid imagery to a point where the conscious processes used to direct the fingers and hands became free from all imaginal elements. It was also determined that there was a marked tendency, as this expert stage was approached, to revert to the former type of conscious direction and control of the fingers and hands, whenever particular difficulties occurred or when fatigue set in. There was a continual slipping back into a method of control where the consciousness involved was rich in representative processes which promptly disappeared again when the higher method of control was used. The fact that the exact nature and final constitution of the attitudes formed in these experiments were not more minutely described is due to the fact that the results were incidentally obtained in an experiment made for an entirely different purpose.

These studies of conscious attitudes, like the attempted analyses of the other thought processes mentioned above, therefore, suggest some important refinements in our methods of psychological observation. A genetic method of observation must be used whereby these thought processes may be observed at all stages of their formation and development so that any change or changes which may occur in these conscious states from stage to stage, as mechanization takes place, may be accurately determined and described. Furthermore, the observations must be more sharply directed and the cross-section analyses repeated often enough for the true nature and constitution of the processes studied to be determined. Such a method of determining the facts would doubtless reveal the true nature and constitution of these higher thought processes and settle some or all of the current disputes about imageless thought and conscious elements. These studies clearly indicate the need of much careful and patient experimental work and the necessity of carefully refining and modifying our introspective methods.

REFERENCES

1. BOOK, W. F. On the Genesis and Development of Conscious Attitudes. *PSYCHOL. REV.*, 1910, 17, 381-398.
2. CLARKE, H. M. Conscious Attitudes. *Amer. J. of Psychol.*, 1911, 22, 214-249.
3. JACOBSON, E. On Meaning and Understanding. *Amer. J. of Psychol.*, 1911, 22, 553-577.
4. MEYER, H. Experimentelle Analyse psychischer Vorgänge beim Schiessen mit Handfeuerwaffe. *Archiv f. d. ges. Psychol.*, 1911, 20, 397-413.
5. MOORE, T. V. The Process of Abstraction. *Univ. of California Pub. in Psychol.*, 1910, 1, 73-197.
6. OKABE, T. An Experimental Study of Belief. *Amer. J. of Psychol.*, 1910, 21, 563-594.

TERMINOLOGY

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Dunlap (1) suggests a uniform system of compound words for the various sensations. The Greek roots are recommended, with prefixes a-, para-, hypo-, hyper-, and the suffixes -meter, -ic, modified according to the regular laws of euphony. For example, hearing would be acusia, with the compound forms anacusia, paracusia, hypacusia, hyperacusia, acumeter, and acusic. The system is extended to senses whose Greek names are not in common use, and several other suggestions of form are made, such as myope and chromopsia.

Attention should be called to the new French philosophic vocabulary in course of compilation by the Société française de Philosophie (2), containing a number of psychological definitions. The present installment (No. 13) includes L and M to Métaphysique. We note the words liminal, localisation, signes locaux, ludique (as an adjective for play), marginal, mémoire, mental, and many terms on the border line between philosophy and psychology.

German terminology is represented by a new edition of Kirchner (3), which has been again revised. Little appears to have been done during the past year in the field of psychological terminology.

REFERENCES

1. DUNLAP, K. Terminology in the Field of Sensation. *Amer. J. of Psychol.*, 1911, 22, 444.
2. LELANDE, A., etc. Vocabulaire technique et critique de la philosophie. *Bull. Soc. franç. de phil.*, 1910, 13, 159-212.
3. MICHAELIS, C. Kirchner's Wörterbuch der philosophischen Grundbegriffe. (6. Aufl.) Dritte Neubearb. Leipzig: Meiner, 1911. Pp. vi + 1124.

BIBLIOGRAPHICAL

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It is interesting to note a movement towards compilation of complete bibliographies of the works of individual writers. The list of William James's writings (4) has been compiled with great care and contains 204 titles. Titchener and Geissler (2) give another supplementary list of the writings of Wundt, completing 1910 and

including a partial list for 1911; three popular articles published 1861-2, and two more recent translations are also included.

Claparède (1) discusses systematic abbreviation of the titles of magazines, and advocates a set of rules for abbreviation in reference work which are nearly identical with those already adopted by the *Psychological Index* and this BULLETIN. The editors of the *Zsch. f. angew. Psychol.* publish (3) a list of abbreviations for magazine titles which are much more condensed. To this plan the objection is raised by Claparède that no ready clue is afforded either to the actual title of the periodical or to the language of publication.

The announcement is made (5) that the annual psychological bibliographies published by the *Zsch. f. Psychol.* and the *Psychol. Index* have adopted a uniform scheme of classification and will in future be practically identical in material and arrangement, the chief point of difference being in the language of the section headings.

REFERENCES

1. CLAPARÈDE, E. L'abréviation des titres des publications périodiques. *Arch. de Psychol.*, 1911, 11, 114-117.
2. TITCHENER, E. B., and GEISSLER, L. R. A Bibliography of the Scientific Writings of Wilhelm Wundt. *Amer. J. of Psychol.*, 1911, 22, 586-587. (cf. 1908, 19, 541-556; 1909, 20, 570; 1910, 21, 603-604.)
3. [ANON.] Abkürzungen. *Zsch. f. angew. Psychol.*, 1911, 5, 630-634.
4. [ANON.] *A List of the Published Writings of William James.* *PSYCHOL. REV.*, 1911, 18, 157-165.
5. [ANON.] Editorial Note. *PSYCHOL. BULL.*, 1911, 8, 334.

DREAMS

BY DR. BORIS SIDIS

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In spite of the fact that much is written on dream states their psychology is still in deep obscurity. Dr. P. Meunier (10) advances the view that dreams occur during transitional states from waking to sleep or from sleep to waking. Dreams are a form of hypnagogic states. In this respect he agrees with Sidis (17) that dreams occur mostly in the hypnoidal state which is the transitional state between waking and sleeping. Dreams which do not occur during the intermediary state Meunier regards as abnormal. The causation he ascribes to mental disturbances and to external and internal stimulations. The pathological dream is of cœnesthetic character and points to a diseased organ. The dream may thus be utilized for clinical

purposes. In his larger work Meunier (11) maintains the same thesis. Dreams are of the character of hypnagogic hallucinations. An hallucination is an isolated fact or percept, the dream is a continuous whole, an episode, a drama. A large part of the work is devoted to an interesting clinical study of dream consciousness.

Dr. Bernard Leroy (9) in his study of dreams comes to the conclusion that the final stimulus which causes awakening is not identical with the original stimulus which causes the dream. The original sensory stimulus is forgotten in the total memory of the dream episode.

An excellent work carried out for a number of years in a true experimental scientific way is that on dreams by Professor J. Mourly Vold (19). The main thesis is that dreams are brought about by the positions of the bodily organs during sleep and in general by kinæsthetic sensations. This is the best scientific study of dreams that has thus far appeared on the subject of dream consciousness. The work should be closely studied by those who wish to undertake an investigation of the psychology of dreams.

Dr. Edmond Cramaussel (2) studies variations of sleep of an infant by observing the modifications of respirations.

Dr. Waterman (20) makes a short study of dreams as a cause of various symptoms in psychopathic maladies. He finds, as many psychopathologists have shown before him, that dreams may give rise to psychopathic disturbances. The dreams themselves are based on experiences of waking life. This corroborates the work in psychopathology carried out by Janet, Prince and Sidis. What is questionable is the symbolism of the dreams under investigation.

Havelock Ellis (3) gives a popular account of dream life. Dr. Ellis accepts the division of dreams into two groups, presentative and representative. The presentative group may be subdivided into two subgroups, "according as they refer to external stimuli present to the senses or to internal disturbances within the organism. The representative group falls into two subdivisions according as the memories are of old or of recent date." He also is of the opinion, now current, that "the internal or external stimuli which act upon sleeping consciousness are not part of that consciousness, nor in any real sense its source or its cause." Representative elements, memory images, constitute the content, the make-up of dream consciousness. Inattention, lack of mental synthesis, disturbance of apperception, emotion, dissociation, fatigue are the factors of dream life. The theory advanced can be put in a nutshell: Sensations and perceptions

(under perceptions Ellis also includes memory images, ideas or what he prefers to describe as "internally aroused perceptions—memories") "are not properly *apperceived*" (Ellis's italics). This generalization gives rise to a speculative theory on paramnesia. In discussing dream symbolism he tells dogmatically that "there can be no manner of doubt that our dreams are full of symbolism." Under the comprehensive term of symbolism he includes language, music, art, the phenomena of synæsthesia, the theory of perception and hallucination in regard to the nature of secondary sensory elements, in fact all forms of association of elements of one sense with those of another.

The psychoanalytic school is specially prolific in the number of articles on dreams. The quantity unfortunately predominates. Dr. Ernest Jones (6, 7), an earnest follower of the school, gives a *résumé* of Freud's work on dreams (4). There is a latent content and there is a manifest content and four mechanisms: condensation, displacement, dramatization and secondary elaboration. Consciousness acts as the censor that suppresses and alters the latent content. The groundwork of every dream is infantile and sexual and is of high personal significance. Dream analysis helps to penetrate into the depths of the unconscious. The biological function of the dream is to lull consciousness to sleep like a nurse telling a story to a child to make it go to sleep. "When however the activity of the endopsychic censor is insufficient to keep back or alter materially the thoughts of the latent content, then we have a nightmare." To get at the symbolic meaning of the latent content is supposed to be the task of psychoanalysis. The paper is illustrated by a few short examples.

Dr. Alfred Rubitsek (16) analyzes Egmont's dream. Symbolism characteristic of decadent thought and the stronghold of Freud's psychoanalytic method is naively employed as is the case with all adherents of the school. The symbolism reminds one of the mediæval symbolic interpretation of the Holy Scriptures. Freud's writings form the psychoanalytic Bible and are quoted with reverence and piety.

Dr. Otto Rank (14) makes a long psychoanalytic study of a girl's dreams, with notes and footnotes, along Freud's lines. The interpretation is ingenious and full of that rank, sexual, artificial symbolism for which the school is so notorious. The painstaking studies, the loyalty, the devotion to the master's great discoveries are worthy of a better cause and remind one of the disciples of Mrs. Mary Baker Eddy. Dr. Rank (15) also discusses a couple of dreams which he traces to an "incest-complex"—*Eifersucht auf die Mutter und Zärtlichkeit gegen den Vater*.

Dr. Sig. Freud (5) gives a few examples of interpretation of dream symbols in a few of his cases. The interpretation is full of Talmudic casuistry in regard to the sexual meaning of certain dream visions.

Dr. Alfred Adler (1) gives the analysis of a false dream of one of his female patients as an illustration of the mechanism of deception in neurosis. The psychoanalysis, as usual with the Freudist, discloses sexual experiences, "psychic hermaphroditism," as the basis of the neurosis.

Dr. Morton Prince (12) in his investigation of dreams does not find any of the elaborate machinery claimed by the psychoanalytic school. Prince finds that in his cases symbolism plays an important rôle. He finds that dream material is derived from a variety of conserved memories and from ideas phantasmagorically running through the mind during the presleeping state. In this he agrees with Meunier and Sidis as to the relation of the hypnagogic and hypnoidal states to the content and mechanism of dreams. Prince lays stress on subconscious motives round which the dream activity plays symbolically. Dr. Prince, however, unlike the Freudists, insists that this symbolism and motivization are present only in some special cases. Dr. Prince is very careful not to make sweeping generalizations and as such his study is important both from psychological and psychopathological standpoints.

Dr. E. Jones (7) sharply criticizes Dr. Prince's work for calling in vain the name of the master's method. To which Prince (13) rightly replies that it makes no difference what the name of the method is provided the method is correct, the facts are true and the work is well done.

Dr. C. G. Jung (8) undertakes in a patronizing way to give what he regards as the real psychoanalysis of Prince's dream cases which Yung claims have been inefficiently, insufficiently and inadequately studied by Prince. Yung's psychoanalysis is full of unconscious sexual humor. Dr. Stekel (18), who is understood to have used psychoanalysis on tens of thousands of dreams and whose name may be regarded as a symbol characteristic of his own psychoanalysis, presents a short communication of a dream study which as to mechanism, symbolism and cabalistic interpretation well illustrates the elaborate artificiality of Freudian dream psychology and ingenious triviality of symbolic sexual psychoanalysis.

REFERENCES

1. ADLER, A. Ein erlogener Traum. *Zentrb. f. Psychoanal.*, 1. Jahrg. H. 3, 1910.
2. CRAMAUSSEL, Ed. Le Sommeil d'un petit Enfant. *Arch. de Psychol.*, 1910, 9, 172-181.

3. ELLIS, H. *The World of Dreams*. Boston, 1911. Pp. 283.
4. FREUD, SIG. *Die Traumdeutung*. Leipzig, 1909.
5. FREUD, SIG. Nachträge zur Traumdeutung. *Zentrbl. f. Psychoanal.*, I. Jahrg. H. 5 and 6, 1911, 187-192.
6. JONES, E. Freud's Theory of Dreams. *Amer. J. of Psychol.*, 1910, 21, 283-308. (See author's abstract in *J. of Abnorm. Psychol.*, 1910, 5, 211-214.)
7. JONES, E. Remarks on Prince's "The Mechanism of Dreams." *J. of Abnorm. Psychol.*, 1911, 5, 328-336.
8. JUNG, C. G. Morton Prince. Eine kritische Besprechung. *Jahrb. f. psychoanal. u. psychophys. Forsch.*, I. Hälfte, 1911.
9. LE ROY, B. Sur l'inversion du temps dans le rêve. *Rev. phil.*, 1910, 69, 65-69.
10. MEUNIER, P. La Valeur sémeiologique des rêves. *J. de psychol. norm. et path.*, 1910, 7.
11. MEUNIER, P. *Les Rêves*. Paris, 1910. Pp. 198.
12. PRINCE, M. The Mechanism and Interpretation of Dreams. *J. of Abnorm. Psychol.*, 1910, 5, 139-195.
13. PRINCE, M. A Reply to Dr. Jones. *J. of Abnorm. Psychol.*, 1911, 5, 337-353.
14. RANK, O. Ein Traum der sich deutet. *Jahrb. f. psychoanal. u. psychophys. Forsch.*, II. Hälfte, 1910, 465-540.
15. RANK, O. Beispiel eines verkappten Oedipustraumes. *Zentrbl. f. Psychoanal.*, I. Jahrg. H. 4, 1911, 167-170.
16. RUBITSEK, A. Die Analyse von Egmont's Traum. *Jahrb. f. psychoanal. u. psychophys. Forsch.*, II. Hälfte, 1910, 451-464.
17. SIDIS, B. *An Experimental Study of Sleep*. Boston, 1909.
18. STEKEL, W. Zur Symbolik der Mutterleibphantasie. *Zentrbl. f. Psychoanal.*, I. Jahrg. H. 3, 1910, 102-103.
19. VOLD, J. M. *Der Traum*. Leipzig, 1910.
20. WATERMAN, G. Dreams as a Cause of Symptoms. *J. of Abnorm. Psychol.*, 1910, 5, 196-210.

NOTES AND NEWS

At the recent meeting of the American Psychological Association at Washington, D. C., Professor E. L. Thorndike (Teachers College) was elected president for the coming year. Professor W. V. Bingham continues as secretary-treasurer.

THE Southern Society for Philosophy and Psychology has elected the following officers for the year 1911: President, Professor R. M. Ogden (Tennessee); vice-president, President H. J. Pearce (Brenau); secretary-treasurer, Professor W. C. Ruediger (George Washington).

THE American Philosophical Association has elected Professor Frank Thilly (Cornell) president and Professor Norman K. Smith (Princeton) vice-president. Professor E. G. Spaulding continues as secretary.

THE PSYCHOLOGICAL BULLETIN

PROCEEDINGS OF THE TWENTIETH ANNUAL MEETING
OF THE AMERICAN PSYCHOLOGICAL ASSOCIATION
AND THE SEVENTH ANNUAL MEETING OF THE
SOUTHERN SOCIETY FOR PHILOSOPHY AND PSY-
CHOLOGY, WASHINGTON, D. C., DECEMBER 27, 28
AND 29, 1911

REPORT OF THE SECRETARY OF THE AMERICAN PSYCHOLOGICAL ASSOCIATION

The twentieth annual meeting of the American Psychological Association was held in Washington, D. C., on Wednesday, Thursday and Friday, December 27, 28 and 29, 1911, in affiliation with the Southern Society for Philosophy and Psychology and the American Association for the Advancement of Science.

Professor Carl E. Seashore, Dean of the Graduate School of the University of Iowa, was the presiding officer. His presidential address Thursday evening pointed out the possibilities of applied psychology, using as a typical illustration the psychological measurements of a singer which the consulting psychologist of the future will make when aiding a young person to decide whether or not to devote himself to a musical career. Many papers throughout the three days' sessions made strikingly evident the fact that psychology in America is seeking to find itself in various fields of application, as well as in the realm of pure psychology.

The meetings were held, with one exception, in the main building of the George Washington Medical School. Two assembly halls were provided for the formal sessions and two rooms were devoted to a large exhibit of both new and standard forms of apparatus. About eighty members were in attendance.

The program began Wednesday morning with a symposium on the demarcation of the distinct differences between "Instinct and In-

telligence." Four formal papers provoked a lively discussion, which made evident most clearly the need and importance of much patient, detailed observation and investigation of instinctive behavior. The opening of the apparatus exhibit Wednesday afternoon was followed by a double program. In one section the papers on mental tests were presented, and in another, the experimental contributions to the study of animal behavior. Double programs were also necessary on Thursday and Friday afternoons to make possible the reading of the large number of papers submitted. Two of these programs were made up of reports of research in experimental psychology. Paralleling them were a program of general and theoretical papers, and a joint session with Section L devoted to educational psychology.

The program which attracted widest interest was that of Thursday forenoon, at which time the Associations met at the Government Hospital for the Insane. A conference had been arranged on the relations of psychology and medical education; and the interest in the papers which had been prepared showed the timeliness and importance of the subject. Several eminent psychiatrists and representatives of medical faculties were present to share in the informal discussion, and although there were extreme divergences of view regarding the type of psychology which ought to be taught and regarding the place in the curriculum where it ought to be introduced, there was marked unanimity of opinion regarding the need of psychology. It is expected that the proceedings of this meeting will be printed in full in the *Journal of the American Medical Association*.

Following this session the two societies and their guests were entertained at luncheon by Professor Franz. On that same evening Professor Franz and Professor Ruediger were the hosts at a joint smoker which proved in many ways to be one of the most delightful occasions of the week, for during the festivities the members had the privilege of hearing anecdotes and reminiscences of the early days of the Psychological Association narrated by President Stanley Hall, the first President of the Association, Professor Ladd, who coöperated with President Hall in getting the Association organized, Professor Cattell, a member of the first council, and Professor Münsterberg, who, having just come from Germany to America, was present at the first annual meeting, held in Philadelphia nineteen years ago.

At the annual business meeting of the Association Friday morning, Professor E. L. Thorndike was elected President of the Association for the ensuing year. Professor Margaret F. Washburn and Professor Max Meyer were elected to membership in the council for

three years, to succeed President Sanford and Professor Thorndike. Professor C. E. Seashore, the retiring president, was elected to represent the Association on the Council of the A. A. A. S.

The following persons, having been recommended by the Council, were elected to membership in the Association: Jasper Converse Barnes, Ph.D., Maryville College; Frederick Stephen Breed, Ph.D., University of Michigan; Lucy Hoesch-Ernst, Ph.D., Milwaukee, Wis.; Mabel Ruth Fernald, Ph.D., Chicago Teachers College; Samuel Weiller Fernberger, A.M., University of Pennsylvania; Joseph Wanton Hayes, Ph.D., University of Chicago; Mrs. Mary Holmes Stevens Hayes, Ph.D., University of Chicago; Samuel J. Holmes, Ph.D., University of Wisconsin; Herbert Sidney Langfeld, Ph.D., Harvard University; Henry C. McComas, Ph.D., Princeton University; John Moffatt Mecklin, Ph.D., Lafayette College; Ethel Chamberlain Porter, Ph.D., East Orange, N. J.; W. H. Pyle, Ph.D., University of Missouri; Carl L. Rahn, Ph.B., University of Minnesota; Christian A. Ruckmich, A.B., Cornell University; William T. Shepherd, Ph.D., Washington, D. C.; H. Douglas Singer, M.D., Illinois State Psychopathic Institute; Raymond H. Stetson, Ph.D., Oberlin College; Elmer Ernest Southard, M.D., Ph.D., Harvard University; Edward K. Strong, Ph.D., Columbia University; J. E. W. Wallin, Ph.D.; Clara Jean Weidensall, Ph.D., New York State Reformatory for Women, Bedford Hills; Harry Porter Weld, Ph.D., Clark University; Edward Moffat Weyer, Ph.D., Washington and Jefferson College; Mary T. Whitley, Ph.D., Teachers College, Columbia University.

The determination of the time and place of the next meeting was left to the Council, with power to act. A cordial invitation had been received to come to Western Reserve University, Cleveland, where the American Association for the Advancement of Science will meet next December. But a meeting at this time was of course deemed inadvisable if the International Congress of Psychology is to be held in New York and Boston at Easter, in the spring of 1913.

The advisability of undertaking to hold this Congress in America as originally planned has been brought into question by certain members of the Executive Committee of the Congress, who have found a lamentable lack of interest in the Congress abroad. Other members of the committee have felt that it is important not to abandon the project in spite of the attitude of European psychologists and the difficulties in the way of holding a successful congress of really international character. On motion of Professor Cattell, the Secretary was instructed to secure by mail from the members of this

Association, the Southern Society, and the North Central Association, an informal expression of opinion regarding the desirability of having the congress in America.

(Since the above was put into type, word has been received from the officers of the Congress that the project of holding the Congress in America in 1913 has been definitely abandoned. The next meeting of the Association will, then, be held next December in Cleveland. This central location will make possible a splendid "get-together" meeting of eastern and western members on the occasion of the twentieth anniversary of the founding of the Association.)

The Council, having for some years back experienced frequent difficulty in securing adequate information regarding applicants for membership in the Association, made public the following announcement: "The Council requests that all recommendations for membership in the Association be submitted to the Secretary at least a month in advance of the time of election, and that these recommendations be accompanied by a statement of the candidate's professional position and by copies of his published researches."

On recommendation of the Council it was voted that a committee of three be appointed by the President to study and report on the relations of psychology and medical education, and to confer on behalf of this Association with other bodies interested in these problems. (Professor W. D. Scott, Professor E. E. Southard and Professor J. B. Watson were appointed.) The Council was empowered to authorize the expenditure of a sum not to exceed \$50 for the expenses of this Committee.

Professor Angell reported the completion of the investigations heretofore planned by the Committee on the Standardization of Mental Tests, and announced in a general way the plans of the Committee for the immediate future. On recommendation of the Council it was voted that the Committee be continued; that the principle of rotation of one member per year be adopted; that the order of rotation be determined by the Committee; and that the new member be chosen by the Council upon nomination of the Committee. \$250 was appropriated for the publication of reports of this Committee during the present year, the conditions of publication to be subject to the regulation of the Council. It was the general sentiment of those participating in the discussion that this appropriation should be renewed annually as needed.

It was also voted, on recommendation of the Council, that the Committee on Tests be requested to hold itself ready to examine and

report upon the relative merit of different forms of apparatus designed to serve the same general purpose. In explaining the object of this resolution, one of the speakers cited the desirability of a body which would be prepared to undertake investigations of the relative merits of the various forms of esthesiometers, tachistoscopes, etc. The committee, of which Professor Angell is Chairman, will welcome suggestions as to possible lines of usefulness.

Professor Whipple made a report of the work undertaken by the Committee on Teaching Experiments. It was voted that this committee be continued. The Association also authorized the expenditure of a sum not to exceed \$50 to meet necessary expenses of the committee.

Professor Warren presented a report for the Committee on Periodicals. It was voted that this committee be continued, with power to add to its membership. It at present consists of representatives of each of the psychological journals, but it was deemed desirable to have a representative for the readers and contributors, as well as for the editors.

A sum not exceeding \$25 was voted to meet necessary expenses in connection with the apparatus exhibit, and the expenditure of a similar sum next year was also authorized.

The following recommendation of the Council was adopted; "The Council, believing that the members of the Association should consider exercising a more direct control over the choice of its officers, recommends the appointment of a committee of three to consider this question and, in the event of their approving a change in the present arrangements, to submit to the next annual meeting the necessary amendments to the constitution." (Professor Aikins, Professor Minor, and Professor Pierce were appointed to this committee.)

The Association voted a most cordial expression of appreciation of the courtesies extended by the officers of the George Washington Medical School and the Government Hospital for the Insane, with special thanks to Professor Franz and Professor Ruediger for their generous hospitality.

REPORT OF THE TREASURER FOR THE YEAR 1911

DR.	
To Balance from previous year.	\$3,077.69
Dues received from members.	243.35
Interest from July 1, 1910, to July 1, 1911.	99.72
Receipts from sales of Psychological Monographs No. 51 and No. 53. .	95.89
	<hr/>
	\$3,516.65

CR.		
Stationery and printing.....	\$75.25	
Traveling expenses (1910 meeting).....	86.16	
Clerical assistance.....	15.75	
Postage.....	56.51	
Express and telegrams.....	6.91	
Printing and distribution of Proceedings.....	8.37	
Appropriation toward printing and distribution of report of Committee on Standardization of Tests.....	150.00	
Appropriation toward printing and distribution of report of sub-committee on Standardization of Methods of Studying Color-vision.....	200.00	
Miscellaneous.....	3.83	
Unexpended petty cash.....	10.65	613.43
Balance in Union Dime Savings Institution.....	\$2,772.99	
Balance in Fifth Avenue Bank.....	130.23	2,903.22
		<u>\$3,516.65</u>

W. V. BINGHAM,
Secretary and Treasurer

HANOVER, N. H.,
December 20, 1911.

Audited by the Council

REPORT OF THE SECRETARY OF THE SOUTHERN SOCIETY FOR PHILOSOPHY AND PSYCHOLOGY

The Seventh Annual Meeting of the Southern Society for Philosophy and Psychology was held at Washington, D. C., on Wednesday, Thursday, and Friday, December 27, 28, and 29, 1911, in conjunction with the American Psychological Association and the American Association for the Advancement of Science. The meetings were held in the George Washington University Medical School, President Shepherd Ivory Franz presiding. The programs for December 27 and 28 were arranged jointly with the American Psychological Association. Following the joint meeting on Thursday afternoon came the president's address on "New Phrenology." On Thursday evening the members of both societies were entertained at a smoker held at the New Fredonia Hotel by Professors Franz and Ruediger.

The following items were passed upon at the business meeting held on Friday morning, December 29.

1. The proposed amendment to Art. II., Sec. 3, of the constitution was adopted.

2. It was resolved that the existing arrangement with the Psy-

chological Review Publishing Company be continued as optional to the members of the Southern Society and be handled as hitherto by the secretary of the society. In the future, however, this option is available only to members residing in the southern territory, but it is no longer restricted to those who are new subscribers. Notice of the above arrangement is to be printed after the constitution on the membership list.

3. The secretary was authorized to drop the names of members after one year of delinquency.

4. The determination of the time and place of the next meeting was left in the hands of the Council.

5. The treasurer's report was audited by the Council and showed a balance on hand, December 23, 1911, of \$65.64.

6. The following officers were elected for the year 1912: *President*, Robert Morris Ogden, University of Tennessee; *Vice-President*, H. J. Pearce, Brenau College, Gainesville, Ga.; *Secretary-Treasurer*, William Carl Ruediger, The George Washington University; Council for 3 years, Shepherd Ivory Franz and John Brodus Watson; Council for 1 year, W. B. Lane.

7. The following persons were elected to membership: Samuel Claman, Howard University; H. E. Cunningham, Lookout Mt., Tenn.; Gardner C. Basset, Johns Hopkins University; Williston S. Hough, George Washington University; Edmund B. Huey, Johns Hopkins University; Herbert Charles Sanborn, Vanderbilt University.

8. Votes of thanks were extended to Dean W. C. Borden for the use of the George Washington University Medical School and to Professors Franz and Ruediger for the smoker.

W. C. RÜEDIGER, *Secretary*

THE GEORGE WASHINGTON UNIVERSITY,
WASHINGTON, D. C.

ABSTRACTS OF PAPERS

The Measure of a Singer. Address of the President of the American Psychological Association. CARL E. SEASHORE, University of Iowa.

(This address is published in full in *Science*, Feb. 9, 1912, Vol. XXXV, p. 201.)

New Phrenology. Address of the President of the Southern Society for Philosophy and Psychology. SHEPHERD IVORY FRANZ, Government Hospital for the Insane.

An examination of the system of Gall shows that the basis for his conclusions was an artificial division of the mind into elements which differ from one another in degree or in kind. Gall attempted to correlate these divisions with divisions of the brain, assuming that the mental processes were localized in certain areas of that organ.

Although this view has been attacked from time to time, it has left its impress upon anatomists and clinicians. Broca had a view of mental and brain relations somewhat similar to that of Gall, and this view was amplified by Wernicke and others.

The schematic subdivisions of the mind were combated, but numerous attempts from the clinical and anatomical standpoints have been made to uphold the doctrine. In this class belong the studies of Flechsig, and the more recent studies of the histological localization of function.

Histologically the cerebral cortex can be divided into a number of areas, which have the same fundamental characteristics of cells and fibers arranged in more or less definite layers, but which differ from one another in the special arrangements of these elements. Because of these differences it has been assumed that the areas have different mental functions.

The direct relation of the so-called sensory and perceptive areas to mental states has not been proven. The histologists have not been able to give any good explanation for the differences in the so-called motor areas, of which, clinically and physiologically, we have more information than of other parts of the cerebrum.

Many clinicians refer to the localization of aphasias as evidence for the localization of mental processes, but even as clinical manifestations the disorders of speech cannot be said to be associated with definite parts of the brain.

Another principle of histological localization is that of definite functions for the different layers of the cortex, but there are no facts which warrant a localization of definite mental states in the individual layers.

It has been assumed that the principle of localization has been settled, but this cannot be accepted, because there is dispute whether mental states, clinical phenomena or cells are localized. There is some doubt about the exact localizations of cell groups in the cerebrum; there is more doubt regarding the relation of clinical manifestations to the injury of certain areas, and there is no evidence to warrant a psychic localization.

All that can be concluded at the present time is that the mind

is associated with brain activity. We are unable to say that the activity of the cerebrum alone is the concomitant of mental processes.

Instinct and Intelligence. HENRY RUTGERS MARSHALL, New York City.

We avoid confusion by considering activities from the subjective and objective standpoints separately.

Objective View.—Activities increase in variety *pari passu* with increase of complexity of animals' structure.

The most striking characteristics of activities of animals of lowest and highest complexity are as follows:

Class A. Activities in simplest animals display (1) Evident biologic value. (2) Directness. (3) Immediacy. (4) "Perfect very first time." (5) Non-modifiable. (6) Innate.

Class B. Activities in complex animals display (1) Often no evident biologic value. (2) Indirectness. (3) Hesitancy. (4) Not "perfect very first time." (5) Highly modifiable. (6) Not evidently innate.

But in complex animals we discover certain activities of class *A*. These we call "instinct-actions." The nearer an animal approaches to simplicity of organization the closer do its activities approach the ideal of "instinct-action." The "instinct-action" of the simple cell may be assumed to reach this ideal. The characteristics of varied activities of complex animals may then be conceived of as due to the "instinct-actions" of cells, or minor systems of cells, in a highly complex system. Hence the varied activities of complex animals may be stated in terms of cell "instinct-action," which may be looked upon as the biologic unit.

Subjective View.—But these varied activities (class *B*) are what we ourselves know as intelligent activities; hence we may argue that intelligence is statable in terms of "instinct-feelings," the psychic correspondents of "instinct-actions," "instinct-feeling" being the psychic unit.

This view is corroborated by introspection, the distinguishing marks of intelligent acts appearing to be due to the emphasis of the correlated "instinct-feelings" involved. If we could grasp the full psychic significance of an "instinct-feeling," by slowing down the process, we should find in it all the essentials of intelligence; and if intelligent acts could be made immediate they would appear objectively as "instinct-actions," and subjectively as "instinct-feelings."

Instinct and Intelligence. C. JUDSON HERRICK, University of Chicago.

The term instinct as popularly used is incapable of accurate scientific definition for it is commonly applied to behavior complexes including variable proportions of structurally predetermined innate action and intelligent action. I would replace the terms instinct action and intelligent action of Marshall by innate action and individually variable action, and I maintain that these two types of action are separate biological functions, both of which are exhibited in some measure by all animals, and that they are independently variable.

Innate action includes the fundamental physiological properties, tropisms, taxes, reflexes, compound and chain reflexes and the inherited elements of all higher behavior complexes. These actions are common, within narrow limits of variation, to all members of a race or species. And they are developed in accordance with the same evolutionary laws (natural selection, etc.) as are the other stable elements in the action-system which is typical for each species. Individually variable action includes all non-heritable acquired behavior from simple physiological modifications resulting from practice, at the lower extreme, to learning by experience and the higher intelligent adaptations, at the other extreme. Individually acquired automatisms are derivatives of individually variable actions.

A special mechanism has been differentiated for the higher forms of individually variable action, viz., the association centers of the brain, whose highly developed mnemonic functions are derived from the simple "physiological memory" of ordinary protoplasm, and whose connections are such as to facilitate functional associations independently of immediate sense stimulation.

Instinct and Intelligence. ROBERT M. YERKES, Harvard University.

Instinct and intelligence, physiologically considered, are two functional capacities or tendencies of organisms. Neither has developed from the other: each is a fundamental organic capacity. Now the one, now the other tendency predominates in the life of the individual or of the species.

Instinctive activities are practically serviceable on first appearance; strikingly perfect in important respects; predictable; heritable in definite form; and suggestive of experiences, and results thereof, which the organism has not had. Intelligent activities, by contrast, are serviceable as the result of trial; practically unpredictable; not

definitely heritable; and suggestive of experiences which the organism has had.

No organism lacks either the instinct capacity or the intelligence capacity. Instinct means, first of all, conservation—the holding to that which has been tested and found good by previous generations. Intelligence means progress—the blazing of new paths.

It is through the study of the behavior of activities in inheritance that we may hope for the solution of our most important questions concerning the relations of instinct to intelligence.

Intelligence as Distinguished from Instinct. CHARLES H. JUDD,
University of Chicago.

The discussions of the relation between instinct and intelligence are very much clearer in their definitions of instincts than they are in their definitions of intelligence. Intelligence is commonly defined by saying that it is merely the outgrowth of instinct, and is like instinct in form; or, if a discrimination is made, intelligence is described in negative terms. It is that which is not inherited. It is not a fixed type of behavior.

The importance of intelligence in human life justifies the demand that we give a positive definition of its characteristics. In the process of organic adaptation there is evolved in the individual the power of initiating activities from inner motives. This is shown by the delay which appears when one of the higher animals is stimulated, and reacts only after a long series of internal processes. The internal processes in this case are more significant in determining action than is the external stimulus. Furthermore, the sequences of external stimuli do not determine the sequences of activities. Within the complex individual new types of relationship are established between the impressions that come from the outer world. Thus the individual, instead of reacting upon objects which stand near to each other in nature, is able to bring together objects that in nature are remote from each other. This bringing together of remote objects is the result of inner processes of comparison or association. The power of making independent associations or comparisons is the highest outgrowth of the evolutionary process. It is superior to memory, which merely retains external impressions. It gives to the individual a power over his environment which he could not have if he merely followed the dictates of the environment.

Such statements as the foregoing make it clear that intelligence is that characteristic whereby an individual becomes superior to his

environment, and capable of modifying what he finds in the environment. In man this ability to modify environment is the characteristic power which differentiates him from the lower organisms. Man has gone so far as to evolve certain forms of activity which are employed chiefly in planning and preparing for changes in his environment. Language is a form of behavior of this indirect type which man works out as a means by which he can ultimately react upon his environment. Language is first involved as a means of reacting to the social environment, as distinguished from the physical environment. After language is produced through social intercourse, it becomes an instrument of inner planning and comparison, and as such promotes the further evolution of a higher form of reaction, namely, intelligent reaction.

Any organism which is characterized by a type of behavior so remote from the lower forms of behavior must be described as having reached a higher stage of evolution. This statement should not be interpreted to mean that there is any breach in evolutionary continuity, but it certainly does call attention to the fact that evolution has progressed to such a point that continuity is not the most important phase of the matter.

Imitation and Animal Behavior. M. E. HAGGERTY, University of Indiana.

Advance in the experimental analysis of behavior tends to make psychological concepts inadequate. Many of the concepts of comparative psychology are of the relative unanalyzed sort, which indicates that in this field we have not pushed our experimental analysis to the end. Imitation is a case in point. One reason why we have not made more progress in our study of imitative behavior is that the concept of imitation has been hampered by its classification into instinctive and voluntary. These adjectives when used with imitation are intended, not as descriptive of objectively observed behavior but as explanatory, *i. e.*, they are intended to indicate the non-observed processes antecedent to such behavior. Yet instinct and volition when taken concretely in the behavior of mammals have the most uncertain significance, and instead of being explanatory they really obscure the great variety of imitative behavior. If we are not to give up the category of imitation in comparative psychology and to withdraw from the experimental study of imitative behavior we must have a reworking of the concept itself. This reexamination of the concept must be made independently of the ideas of instinct

and volition and be based on objectively observed facts, *i. e.*, upon facts which have been experimentally determined. There are not enough such experimentally determined data for an adequate reorganization of the concept, but the recent work on rats, cats, birds, monkeys and apes gives some basis upon which to work. Such a reorganization must take account of all the factors that determine attention and also of the various levels of accuracy and complexity in the imitative behavior. We may for a time be compelled to have a different grouping for different species of animals.

The Discrimination of Articulate Sounds by Cats. W. T. SHEPHERD, Washington, D. C.

The paper is a report of experiments which were made with cats to determine their ability to discriminate articulate sounds. The major part of the work of the experiments was done by the writer's wife, Mrs. Barbara Shepherd.

One of the animals used in the experiments was seven months old, the other about three years old. The younger cat had not previously been given any name, and had no training in the discrimination of words. The other animal had previously been given a name, different from that given it in the experiments. Both were gray house-cats, and both were females.

The experimenter called the name given the animal and also other words in conjunction. The cat was to show its discrimination of the name given it from the other words used by appropriate motor reactions to its name, such as rearing up in the cage and looking for food to be given it when its name was called, and by not so responding when the other words were called. Suitable control tests were employed.

The younger cat began to show indications of forming the proper association on the third day. On the thirteenth day it had perfected the association. The older cat first showed indications of discrimination on the tenth day. On the twenty-fifth day of the experiments it properly responded nineteen times in twenty trials.

The writer concludes from the experiments that cats are able to discriminate articulate sounds. The younger animal took 150 trials of each auditory stimulus to perfect the association, the older cat 490 trials, the younger of the two individuals learning much more rapidly. In rapidity in forming the association, these two cats showed a rough correspondence to ability in raccoons, in similar tests, to discriminate words.

Some Experiments on the Brightness Value of Red for the Light-Adapted Eye of the Rabbit. M. F. WASHBURN, Vassar College.

In order to eliminate the brightness error in experiments on color vision in animals it is not sufficient to show that the animal tested can distinguish a color from the gray that a color-blind human being would see in place of the color, but the animal must be proved capable of discriminating the color from all grays. The present experiments attempted to find whether any one of a series of gray papers was indistinguishable from the Bradley saturated red paper to the light-adapted eye of the gray rabbit. An error mentioned by Watson as incidental to the use of colored papers, namely, that when pasted on surfaces they show irregularities that would serve to distinguish them was eliminated by pinning the papers on the two doors of a food box, and pinning them on freshly for each experiment. Food was in both compartments of the box. The doors could be pushed open by the rabbit, but the door carrying the gray paper was always bolted on the inside. The gray paper was sometimes on one door and sometimes on the other. Fresh red papers were used in each test, to eliminate a smell error. To avoid the possibility that the rabbit might distinguish the red paper from the gray by smell, in many of the tests gray paper was put under the red and red under the gray, a narrow slit being cut in the upper paper at about the level of the rabbit's nose. This mixture of the two smells never had any effect on the discrimination. To show that the animals were not guided by differences in the surfaces of the two papers, red and gray velvet were substituted occasionally for the papers, without at all interfering with the discrimination.

The five rabbits tested were all able to discriminate the red papers from Hering grays number 6, 7, 15, and 24; but all failed to discriminate red from the very dark gray number 46, and from the black paper supplied by the Stoelting Company. Red would thus appear to have a low stimulating power for the light-adapted eye of the rabbit. The experiments were performed in collaboration with Miss E. Abbott.

Modifiability of Behavior in the Earthworm Allolobophora fætida.

ROBERT M. YERKES, Harvard University.

By means of a T-shaped glass labyrinth, in one arm of which were placed a strip of sandpaper and a strip of blotting paper moistened with NaCl(8N) earthworms have been tested for modifications of behavior.

The following results are presented, subject to revision in the light of further observations:

1. The worms have not acquired a definite habit of turning directly to the open arm of the T and thus escaping to a moist dark tube.
2. Certain modifications have appeared during daily series of trials.
3. There are indications of tracking.
4. The animals rapidly fatigue. Five trials per day prove more satisfactory than ten, fifteen, or twenty.
5. In so far as the worms learn to follow a direct path through the T, they do so apparently by the use of certain cutaneous sense data rather than by inner kinesthetic data.
6. The first trial each day almost invariably presents numerous mistakes.
7. There are some indications that the sandpaper becomes a "warning" against the salt which lies beyond it in the arm of the T.

The Nervous and Non-Nervous Reactions of Actinians. G. H. PARKER, Harvard University.

When the column of a sea-anemone (*Metridium marginatum*) is touched gently or otherwise stimulated, the animal responds in a few seconds by contracting the longitudinal muscles of its mesenteries whereby the oral disk is withdrawn. This reaction is better elicited from the oral or aboral edge of the column than from the middle of the column. If a crystal of magnesium sulphate is allowed to dissolve on a spot on the aboral margin of the column, that spot in a few minutes becomes insensitive to stimulation though the adjacent margin may retain to the full its sensitiveness. Since the mesenteric muscles are situated far from the point of stimulation, the reaction in question is undoubtedly nervous in character.

When the equatorial region of the column of the sea-anemone is stimulated mechanically, there follows in the course of half a minute or so a circular constriction of the column due to the contraction of the circular muscles. This constriction occurs with regularity even after this region has been anesthetized with magnesium sulphate. It is therefore probably non-nervous in character and dependent upon the direct stimulation of the circular muscles.

Thus sea-anemones possess not only muscles controlled by nerves such as are seen in the higher animals, but probably also muscles that are directly stimulated, such as have been observed in the more primitive metazoans, the sponges.

Seventeen Different Definitions of the Term "Tropism" as Applied to Reactions in Organisms. S. O. MAST, Johns Hopkins University.

The term "tropism" was first used by Decandolle (1832) in the study of reactions of plants to light. He prefixed "helio," thus making "heliotropism" and used this term in a very definite sense, indicating merely the fact that plants bend toward the light. But the term "tropism" soon came to signify not only bending toward but also the processes involved in bending, both real and imaginary, and since then it has been applied to almost every conceivable sort of reaction. I have collected seventeen different definitions of this term, varying in meaning from the practically all-inclusive one of Willey (1910)—"The word tropism means the tendency to react in a definite manner towards external stimuli"—to the all-exclusive one of Torrey (1907),—"In heliotropism as well as in galvanotropism, the oriented organism is in a condition of physiological stimulation, and . . . the response to stimulation is local."

In nearly all of the definitions orientation is implied as one of the distinguishing characteristics of "tropisms," and some use the term merely to indicate orientation, but if nothing more than this is implied it would certainly be much less confusing to use "orientation," which has a definite meaning.

About one half of the definitions, including three different ones by Loeb, contain the idea that "tropisms" are orienting reactions caused by the *continuous* action of the stimulating agent, *i. e.*, that the stimuli resulting in orientation are not due to change of intensity but to "constant intensity." As Loeb puts it, "they are a function of the *constant intensity*" (ital. mine). The only trouble with definitions implying this is that there is no conclusive evidence indicating that orientation in any organism is ever due to continuous action of the external agent, while it has been demonstrated to be due to change of intensity in a number of cases. There is not the slightest evidence that "tropisms" as defined by Loeb form a class of specific reactions essentially different from other reactions as he, Bohn and others maintain.

As matters now stand it is utterly impossible to know what is meant by "tropisms" unless it is first definitely stated according to which of the 17 or more definitions the term is used.

Behavior of Fire-flies (Photinus ardens ?) with Special Reference to the Problem of Orientation. S. O. MAST, Johns Hopkins University.

The fire-flies studied are found in dark crevices or under ground

during the day. In the evening when it is still light enough to read they come out; the females crawl to the tips of grass or other objects and remain quiet; the males fly about and glow fairly regularly at intervals of about five seconds. The females do not glow unless light from the males or from some other source is flashed on them.

When a female glows in response to the glow of a male, the male ordinarily turns directly toward her. This is repeated until the two come together, after which copulation takes place. If a female is held near a male he pays no attention to her unless there is actual contact, showing that neither objective vision nor smell is functional in mating.

The males do not orient when exposed to continuous illumination. They respond only to flashes of light and do not react until after the light has disappeared. Thus orientation may take place in total darkness, and it is surprising how accurately these animals turn through the proper angle in the total absence of the stimulating agent that caused the response. Here we have a case in which it is clearly demonstrated that light does not act continuously in the process of orientation as demanded by Loeb's theories, a case in which it is also clearly demonstrated that continuous stimulation is not necessary to keep the organism oriented.

No difference could be detected between the glow of females and that of males either in quality or quantity of light emitted and yet males rarely if ever respond to the glow of other males, showing that in some way they distinguish between the flashes of light produced by opposite sexes. It was demonstrated that this is not due to possible minute differences in color, form or intensity of the glow. The glow of a female in response to a male, occurs shortly after that of the male, while among the flashes of different males there is no such time relation. The sequence in the time of glowing is undoubtedly an important factor in the process in question, but many observations indicate that it is not the only factor, although no others were discovered.

A Critique of the Discrimination Test: a Study in Animal Behavior.

JEAN WEIDENSALL, State Reformatory, Bedford Hills, N. Y.

Taking the black-white discrimination test as typical of the discrimination method, we proposed to investigate the relative efficiency of the black and the white after and during learning in such a test. We suspected that of the two or more stimuli presumably involved in learning the ordinary test of this kind only one, as a matter of

fact, might be used. This suspicion was based upon the fact that previous experiments have proceeded as though but one discrimination were necessary—that of the two stimuli from each other—whereas three discriminations are essential. Until each quality is first discriminable from its background, the two cannot be discriminated from each other. Any conclusions, therefore, stated in terms of the discriminability of the two qualities are unfounded so long as we continue to display the stimuli against the unknown background of our various problem boxes over against which one or both of the stimuli may be inefficient throughout the entire test, or unequally efficient at different stages of the learning process.

Our conclusions based upon a series of five carefully controlled experiments with 36 rats were:

1. Black and white are both visible against the background of our box; but they are not equally so. Their effectiveness varies as 1 : 2 :: white : black. That is, it takes twice as long to learn the problem of following black alone as it does to follow white alone. Wherefore,

2. When the two stimuli are supposedly involved only the white is used because the black is so much more difficult to perceive. And after learning the typical discrimination test, only the white is efficient. Thus the standard discrimination method in a typical instance has reduced itself to one of simple recognition.

Since the standard discrimination test is one whereby the existence of differing sensory qualities are determined in terms of *their efficiency in conduct*, since, that is, we say that two qualities are discriminated because they call out different reactions, it is a serious criticism if the conditions of our experiments have not been such that both the stimuli are inevitably involved and that the chances for their efficiency are equal.

The second half of the paper concerned itself with an investigation of the relative efficiency of *quality* and *position*. Previous tests have isolated each in turn, series, form, intensity, and extensity, but so far as we know quality and position have not been isolated. Yet in all these tests the quality of the stimulus and its “thereness” are independent variables; for the position of the quality and the position of the food bear a fixed relationship or set of relationships. There is nothing, accordingly, to prevent the animal from learning in terms of the “thereness” of the stimulus rather than in terms of its specific quality. Had the two been varied independently either one or the other might have proved to be of relative or absolute efficiency. The results on this point will be published later in detail. We found

that the variation of position was a confusing factor and that though the complete abstraction of quality from position is entirely possible for us it is extremely difficult, if at all possible, for the rat.

Some Experiments on Pitch-discrimination in Dogs. H. M. JOHNSON,
Johns Hopkins University.

A preliminary report was presented of work begun in April, 1910, on two blind dogs, in an attempt to test by a better method the work of Kalischer, Rothmann and others on pitch-discrimination in the dog, and localization of the center for pitch.

The dogs were taught to react in one way to middle C and in another to the G above sounded on tuning forks, and learned the problem in 285 and 405 trials (19 and 27 days) respectively. When Stern variators were substituted for the forks, the number of trials necessary to complete recovery from disturbance was respectively 120 and 90. When forks and variators were used indifferently in a given series the number of trials required was respectively 150 and 600. (An accident producing considerable emotional disturbance accounts for the longer learning time of the second animal.) When the problem of discriminating between chords containing one or the other stimulus tones was set, the learning time was respectively 615 and 660 trials, but the daily percentage of error seldom exceeded 20.

When last summer the same dogs were given the problem of discriminating between middle C and the E above and made to work at the problem with the operator removed from the room, the problem was yet unlearned after 505 trials each. On suspicion that the mode of reaction chosen was not sufficiently definite, and that enough attention had not been given to the factor of "delayed reaction," a special stimulus box was constructed, forcing the animal to turn at right angles right or left toward the food box chosen, and permitting punishment to be given in case of incorrect choice. The stimulus was given by the Helmholtz method of "tandem-driven" forks equipped with König resonators, giving practically pure tones with widely variable intensity. Two normal dogs were introduced as a control. After 300 trials punishment was introduced for incorrect choice. The problem is yet unlearned after about 1,000 trials each.

These results indicate that neither in Kalischer and Rothmann's work nor in the former part of this experiment, were the animals certainly reacting to tone at all; and that our anatomical conclusions to be reliable must be supported by better behavior results than have yet been obtained.

The Use of the Maze in Comparative Psychology. EDWIN G. BORING and LUCY M. DAY, Cornell University.

In the study of the animal mind comparative psychology must always make reference, either implicitly or explicitly, to human consciousness under similar conditions. It is this reference that distinguishes comparative psychology from the study of animal behavior. In such a complex experience as the learning of the maze the reference must be fully explicit. Hence, as a preliminary to the use of the maze with animals, there should be made a thorough analysis of human consciousness under as similar conditions as possible.

Such an analysis has been undertaken by Miss Lucy M. Day and the writer at Cornell University. We present herewith a preliminary report on the work.

The Watson circular maze was duplicated on a large scale. Sixteen observers, most of them trained in introspection, learned the maze, giving full introspective reports. The reports were independently analyzed by the two experimenters to obtain a numerical estimate of the processes involved in making the turns. The two estimates showed an agreement of 85 per cent.

The analysis shows that the maze-learning consciousness consists of three phases: (1) Determination of direction after making the turns, (2) guidance within the passages, and (3) location of the turns.

The determination of direction after the turns involves five factors—attitudinal, verbal, visual, kinesthetic, and automatic. Each of these follows a definite course throughout the learning process, although the course varies somewhat with the ideational type of the observer. The attitudinal factor is of importance in only the first two or three trials. The verbal factor reaches its maximum very early, the visual slightly later. They both give place to kinesthesia, which in turn is resolved into a somatic automatism.

Moreover, the course of learning, with regard to the first phase, naturally falls into three periods. In the first period, attitudes and verbal and visual imagery are advantageous to learning, while the introduction of motor imagery is disadvantageous. In the second period, kinesthesia becomes favorable, while attitudes and verbal and visual imagery become unfavorable. In the third period, automatism predominates, and learning is retarded by the introduction of any form of imagery.

With respect to the other two phases of the learning process, our

analysis is not yet complete. So far as our results go, however, they indicate that vision is most important for guidance within the passages, and that both motor and visual factors are involved in the location of turns.

An Experimental and Introspective Study of the Human Learning Process in the Maze. F. A. C. PERRIN, University of Chicago.

Two types of maze were employed in this experiment — the pencil maze, and a maze through which the subject walked. In either case the subject was blind-folded, and learned the route by trials. The time and error curves obtained were quite comparable with the curves based upon the records of the white rat in the maze. (1) The introspections, however, brought out the fact that it was essentially a human, and not an animal, learning process, inasmuch as it was conscious learning and, as such, had involved in it the rudiments of the higher cognitive activities. The various subjects built up and employed ideational controls for the maze. In doing so, they employed in a rudimentary way at least the processes of attending, discriminating, judging, inferring, reasoning. It was the human mind at work, not the animal mind. (2) While the rational element was necessarily present, the actual method was distinctly that of trial and error. Some special mazes, designed to give the maximum opportunity for reasoning, failed to call forth any other method.

The rational element was necessarily present. It was not only present but it was effective, and not merely accessory. This fact suggests the question of its relative efficacy. The adult human, in learning a maze, does not improve upon the time and error records of the white rat in any pronounced way, but he is decidedly at an advantage in tests that call for an application of the learning experience to modified conditions, such as is represented when the maze is altered in size, or rotated.

Memory versus Imagination—an Experimental Critique. LILLIEN J. MARTIN, Stanford University.

The paper gives an account of an experimental examination which the writer had made at Bonn and Stanford Universities of the results of Mrs. Perky's experiments ("An Experimental Study of Imagination," *Amer. J. of Psychol.* 21, 422) on the differences between visual memory and imagination images.

As the differences between the two kinds of images which Mrs. Perky had found were not present in the writer's results, she looks

upon Mrs. Perky's results as having only an individual character, and considers it therefore a mistake to assign to them that general character which has been done in a recent textbook.

Literary Self-projection. JUNE E. DOWNEY, University of Wyoming.

In connection with an extensive study of the imagery aroused by reading poetic fragments, observations were made as to the frequency and kinds of self-projection—self-projection being defined as any form of explicit self-reference—in order to determine the significance for the psychology of self-consciousness of the various forms of self-projection and their function in esthetic appreciation.

The discussion concerned itself chiefly with the forms assumed by the visual and kinesthetic self-projection and with the relations subsisting between them.

It was shown that the different reagents saw themselves with varying frequency as actors in or spectators of a visualized scene. The visual self might appear as a vague figure or in considerable detail. Again, the orientation of the visual self might be vague or exceedingly precise. A double visual self-projection was not unusual.

Kinesthetic or organic self-reference was found to occur frequently and to assume the following forms: (1) Objectified and fused with the visual self; (2) oscillating with the visualized self and localized in the body of the subject; (3) objectified and fused with a visualized object or a visualized person other than the self; (4) abstracted from all visual content and objectified or not.

Relative to the esthetic value of self-projection, a distinction was made between an emphatic and non-emphatic self-projection and the question raised as to the significance of the latter mode of self-projection, particularly in the form of the visualized self. The possibility, however, of an *Einfühlung* mediated by a purely visual objectification, without organic resonance, was recognized.

The Nature and Limits of Introspection. R. DODGE, Wesleyan University.

Introspection is not only an instrument of psychological investigation, it is also itself a psychological process or group of processes, and as such must be capable of psychological analysis. Such an analysis should furnish data for the evaluation of the products of introspection, for an estimate of its reliability as an instrument, and for an estimate of the factors of mental life that it is best calculated to disclose.

Lacking a sense organ, introspection is analogous to sense per-

ception only in the processes of apperceptive integration. While sense objects are integrated as a world of things, the objects of introspection are integrated as a unitary experience.

Dependence on apperceptive systems and actual noetic patterns gives rise to gross sources of error, limits its application, and prevents the disclosure either of mental elements or the fundamental processes of mental life. The phenomena of introspection are not final facts of mental life, but like the phenomena of sound are indicators for scientific construction.

Emotivity and Emotion in their Relations with Adaptation. E. B. HUEY, Johns Hopkins University.

Emotivity is a psycho-organic disposition to interrupt adaptations felt to be called for, and for which the organism has at least partial resources, displacing these with derivative phenomena characterized by disorder and misfit. The ensemble of phenomena characterizing such interruption of adaptation is properly termed emotion.

Clinical observation reminds us that psychology tends to fixate on a few "classical" emotional expressions, the vasomotor and visceral (Lange-James Theory), the sentimental (heart, tears, etc.). Clinical observation shows almost equal involvement of all organs and functions, and shows opposite disturbances for emotions of the same name and almost identical disturbances for emotions of opposite names, the only common and essential feature being the break in adaptation, with disorder and misfit derivative functionings.

Emotional expression depends on (1) what functionings are called for by the situation; (2) what functionings happen to be in use at the time; (3) early acquired habits of reacting in a given manner to a given emotional situation; (4) what organs or functions are most enfeebled, these being affected preferably; (5) occurrence of misfit instinctive functionings of possible utility in race experience; (6) functionings suggested to the individual in the fatigue of emotion, by social custom or contagion or by auto-suggestion.

Intellectual and linguistic disturbances in emotion have been especially neglected, and are prominent and representative of the emotions of many persons. The brain itself may be as basal an organ of emotion as the heart (Janet), and for many persons disturbances of the pharynx, bladder, genitals, or skin "mirror the soul" more closely than do the heart or blood vessels.

The real cause of emotion is a failure in the mechanics of brain tegration, immediately occasioned by the occurrence of factors,

inner and outer, that are too difficult of synthesis under the given conditions and to whose action the organism may be abnormally sensitive. An instinct only becomes an emotion when it is malapropos or when it occasions complexity and strain too great for synthesis and for satisfaction of its intent.

Of theories of emotion, the present presentation owes almost everything to the clinics and lectures of Professor Pierre Janet.

Organic Sensation and the Symbolic Imagery of Thought. (By title.)

ELSIE MURRAY, Wilson College.

The term organic is here limited to the awareness of general organic reaction, internal or external, as distinguished from the awareness of specific bodily movements.

The object of this paper is to emphasize the rôle of this organic factor in the consciousness of meaning, and to urge an adoption of terms, and an introspective training which will enable the average observer to detect and name this component when present.

The attention of the writer was first attracted to this phase of the problem through certain introspections on the words *beauty* and *beautiful*, in which the meaning of these words appeared in consciousness not in illustrative but in reactive terms, in the guise, that is, of the actual or imaged recall of the total organic set characteristic of the esthetic mood. Systematic investigation of this linguistic peculiarity, its relative frequency and importance, seemed at first impracticable, owing to the difficulties inherent in the technique of organic introspection. Recent observations have, however, thrown a new light on the problem. The use of an extended imagery questionnaire in an introductory class of forty-five has brought emphatically to notice the fact that organic attitudes as wholes are accessible to the introspection of the relatively untrained observer. Through the use of stimulus words such as expectancy, impatience, fright, surprise, relief, etc., the possession of a fairly wide range of definite organic imagery¹ was roughly demonstrated. The spontaneous functioning of this imagery was then tested as follows. A list of abstract and general terms, such as mental, delicate, difficult, mistake, possible, etc., was placed in the hands of the student, with instructions to state in what terms the meaning of each word seemed to present itself. In the results organic and motor imagery claim at least an equal prominence with visual and auditory, though the preceding

¹ The question as to the central or peripheral nature of the recall is here irrelevant, since the accessibility of organic reactions to introspection, and the richness of subjective revival, is alone at issue.

tests and questions had indicated the special vividness of visual imagery.

The results of later and more accurate tests are not yet available. The writer feels, however, sufficient assurance to prophesy that a similar preliminary training, and the adoption and rough definition of a uniform set of terms for felt organic attitudes, such as excitement, stimulation, depression, irritation, etc., would enable many now reporting their ideation as purely verbal to detect a concrete conscious content. The value of a certain measure of such organic ideation hardly requires emphasis. The relative simplicity of the organic attitude, its vital relevancy to the total meaning, its status as the natural center of a system of irradiating associations, give it an intrinsic representative value far above that of the arbitrary verbal symbol, or the "pure thought" element of the imageless thinkers.

A Study of Meaning as Inferred from the Methods of Attacking Mathematical Problems. (By title.) JOSEPH PETERSON, University of Utah.

This study was made on sixteen high school students throughout the second half of their first year's work in algebra. The investigation was carried on by the writer, who used every means possible, without interfering with the students' whole-souled attack on the problems, of obtaining the mental content involved in the operations. A special method was that of comparing the work of the best with the poorest students and of ascertaining as far as possible in what specific ways this difference in mathematical ability manifests itself.

As a rule the poor students fumbled on their problems, treating the algebraic expressions not as symbols representing experiences or relations beyond themselves but rather as things-in-themselves. They worked too much in terms of percepts rather than concepts. Frequently, in operations for which the general formula to be followed was well known, they failed because of not seeing in the problem the general principles represented by the formula; that is, they failed to isolate the essentials of the solution and were consequently bound to treat each case as a "law unto itself," as one would treat a puzzle. This was especially noticeable in cases where certain "ear marks" would be altered, as the interchange of terms in an equation; or where an equation to be solved lacked a term, *i. e.*, had a zero coefficient. In general the weakness displayed by some of the students was one of failure to isolate essentials and to hold them in mind when once recognized. The stronger students were keener in

the perception of the general direction that a solution must take and in recognizing the larger aspects of problems, the principles involved in them. These students profited more by experience because they attended particularly to the aspects common to many problems.

The difference is one of the degree of meaning perceived in the problematic situations presented. Meaning is a sort of disposition toward activity in which certain fundamental qualities of experience are singled out, or abstracted, and thrown into the foreground to guide action. The meaning of anything is determined not only by past experience with that thing but also by its particular relation to its present purpose. Is meaning merely a composite of sensory images? If so, what holds these images together and gives them relation in any situation?—more images? If images *only* constitute meaning, and if two images may suffice to make meaning, one symbolizing or “meaning” the other, how can one tell which is which, without some larger emotive background or motor attitude giving trend to experience?

The Rôle of Attention in Advertising. EDWARD K. STRONG, JR.,
Columbia University.

The first function of an advertisement is to force itself upon our attention. Why certain advertisements fail in this respect and why certain others arouse our interest so that we read them clear through is the problem of my research.

In taking up this work three problems of method have been first attacked. The results of the first, which is now practically completed, indicate that the method of simultaneous presentation of many advertisements gives no valid results, while the successive presentation of this same material gives surprisingly constant results from different subjects. The second problem as to whether a constant rate of presentation or a rate varied by the subject at his pleasure gives results more comparable with the actual conditions of the casual reader is still to be determined. And the third, as to whether experimental results, when the subject knows he is being tested, check up with the actual impressions received by the casual reader, is still not settled, although enough data have been obtained to indicate pretty strongly that relatively the results are the same.

But we are interested not only in learning why certain advertisements are noticed but also in studying the differences between advertisements which are remembered for themselves and those which make memorable instead the commodity. There is a great difference here, but the factors comprising it have not yet been made clear.

There have been so far several by-products of this investigation of considerable interest to psychology. Two might be mentioned. The first is that there is no indication of the potency of either primacy or recency when more than ten advertisements are shown successively and then tested for attention-value and memorability by the recognition method. And secondly, it seems conclusive that advertisements are as "simple" *psychically* as nonsense syllables, at least as far as attention and recognition enter. This points to an important implication psychologically. Is it not true that because of the insistence on the use of so-called simple *physical* objects, psychological investigations, such as in the field of esthetics, have been falling off since the physically simple material has been studied? Now the use of advertisements has shown that those that obey the canons of art are the best attended to and remembered. Why can they not be used then in more wide-reaching esthetic studies? Is it not time, indeed, for an advance from the "simple" experimental material to that more related to experience?

A New Method of Studying Mediate Associations. M. F. WASHBURN,
Vassar College.

The term mediate association is taken in the following sense: A process *A* is followed in consciousness by an apparently unassociated process *C*; later it appears that the connection was made by means of the process *B* formerly associated with both *A* and *C* but not in the present instance appearing in consciousness. The method used to study mediate associations thus defined was as follows: the observer was given a stimulus word and instructed to react with another word which should be 'wholly unassociated with the stimulus word. The method offered a good opportunity to study the effect of a definite task or *Aufgabe* set the observer. A number of typical mediate associations resulted in the course of the 662 experiments performed. The instructions, which inhibited ordinary associative processes, allowed the following processes to occur:

Sound associations: the instructions diminished attention to the meaning of the stimulus word and thus strengthened sound associations.

Perseverations from recent experiences of the observer.

Perseverating reaction and stimulus words, but not those used in the experiment immediately preceding.

Words associated with perseverating reaction or stimulus words.

Words of meaning directly associated with the stimulus word, the

fact of the association being overlooked through the tendency of the instructions to direct attention away from the meaning of the stimulus word.

Mediate associations.

The actual experiments were carried on under the author's direction by her pupil, Miss V. Atherton. The paper appears in full in the January number of *The American Journal of Psychology*.

The Effect of Adaptation on Temperature Discrimination. E. ABBOTT, Vassar College.

After simultaneously adapting the right and left hands to temperatures with a difference of five degrees, discrimination for temperatures slightly warmer was tested. Adaptation to moderate temperatures had more effect than to extreme temperatures.

The Relation of Reaction Time to the Duration of Auditory Stimulus. GEORGE R. WELLS, Johns Hopkins University.

Five lengths of stimulus were used, viz., 7σ , 30σ , 51σ , 76σ , and 106σ . No characteristic difference was found in the reactions to these different stimuli. When a subject was given a long preliminary training in reacting to a stimulus of one of the above lengths and was later presented with series of stimuli of varying durations, he reacted to them all in the same way, including the one to which he had been "trained." And when a subject was "trained" to one duration of stimulus and then reacted to another stimulus of very different length, no difference was found in the reaction times of the two series.

A' Pigment Color System. ALBERT H. MUNSELL, Boston.

This system aims to classify and visualize color relations in pigment form. It is built up experimentally, with the help of a photometer, Maxwell discs and the trained capacity of the painter, using the consensus of many individuals. Charts and models present the measured image, while decimal notation and a score provide for graphic records.

This classification depends on the recognition of three color dimensions—value, hue and chroma—arranged spatially as follows. A central vertical axis represents changes in value (painter term for luminosity) from black at the bottom to white at the top, the progression being logarithmic to follow the Weber-Fechner law. The value of every point on this axis determines the level of every possible

color of equal value. Vertical planes intersecting in this axis represent particular hues, the opposed portions being complementary in hue. Any three planes separated by 120° form a complementary trio, etc. Thus the angular position of any hue is determined. Chroma (intensity of hue or "saturation") is measured by the perpendicular distance from any point to the vertical axis, its progression being arithmetic.¹

Thus is constructed a solid in which every horizontal plane corresponds to one and only one value; every radial plane contains colors of but one hue; and the surface of each cylinder concentric with the axis contains colors of equal chroma. Each point in this solid stands for one and only one color, and when these three dimensions of a color have been measured, its position in the solid is obvious.

The system begins with central gray—the balancing point for pigment mixture as white light is for spectral hues. No regular solid portrays the unequal degrees of pigment value and chroma disclosed by measurement, but the *sphere* suggested by Rünge (1810) is a convenient model for establishing balanced relations. The spherical equator comprises ten equal hue steps arranged as five complementary pairs, all of equal chroma to accord with equal departure from the neutral center, and of middle value to accord with their level. Rotation causes retinal fusion of this hue-circuit in neutral gray. Zones lighter to white and darker to black are similarly established. At high speed the sphere reproduces the white-black axis. A certain low speed presents these balanced color zones to the eye at such rate that their vividness is almost prismatic.

Stronger chroma in various pigments projects beyond the sphere describing an irregular solid or *color tree*, whose trunk is the white-black axis, with branches extending to the maxima of red, yellow, green, blue and purple. The tree is a quantitative and qualitative statement of all pigment mixtures. These are displayed in a *color atlas*² whose charts—horizontal, vertical and oblique—are worked out in matt color to satisfy the three scales of measure.

The Retina and Righthandedness. H. C. STEVENS, University of Washington.

Measurements of the space sense of the retina for symmetrical extents upon the same retinal meridian were made by that form of the method of average error which Müller calls the determination of

¹ *Color Notation*, Munsell, Boston, 1905. PSYCHOLOGICAL BULLETIN, 1909, 6, 238

² *Atlas of the Munsell Color System*, Wadsworth Howland & Co., Inc., Boston.

equivalent stimuli by means of the method of limits. The standard extents were 40, 80 and 200 mm. There were four observers each of whom made 1,920 observations. The constant error for each standard was determined in 4 meridians of the field of vision, viz., the vertical, horizontal and right and left oblique meridians. The apparatus consisted of a black velvet disc 61 cm. in diameter. The center fixation point served as the middle point between two adjacent extents. The outer limits of the extents were marked by white spots. One of these spots was carried upon a movable radius which permitted the variable extent to be made larger, smaller or equal to the standard extent. Observations were made with the right and left eyes separately. The results may be stated as follows: (1) In the horizontal meridian, the right half of an extent in the field of vision is overestimated. (2) This overestimation holds true for both right and left eyes. (3) The extent which is overestimated forms its retinal image upon the left corresponding halves of the two retinas. (4) The left corresponding halves of the retinas are connected exclusively with the left hemisphere of the cerebrum. (5) By reason of the fact of a marked difference in the space sense of the two halves of the retina, those objects in the right half of the field of vision, by appearing larger, attract the visual attention which in turn leads to grasping movements of the right hand. The hand thus favored by earliest experience acquires a special skill which causes it to be used in all manual acts requiring the greatest precision.

The Determination of the Sensitivity of the Retina to Colored Light in Terms of Radiometric Units. (By title.) C. E. FERREE, Bryn Mawr College.

About a year ago the writer undertook to determine the relative and the absolute sensitivity of the retina to colored light in terms of units that can be compared. Since several years will be required to complete this work, he has thought it best to publish a preliminary note showing briefly the purpose and scope of the investigation. The following points will serve to indicate what is being attempted in this study.

1. All measurements of sensitivity will be made in terms of the number of radiometric units required to arouse color sensation. This will give an expression of the sensitivity of the retina in units that can be compared. At present we have no estimate of the comparative sensitivity of the retina to the different colors further than is expressed by the relative width of the collimator-slit that has to be used to

arouse color sensation when a light-source of a given candle-power is used. This kind of comparison is obviously unfair, because such different amounts of energy are represented from point to point in the spectrum that a given width of slit would admit many times the amount of energy to one part of the spectrum that it would to another. In short, no proper estimation of the sensitivity of the retina to color, relative or absolute, can be made with the methods now in use.

2. The limits of the color zones will be determined with colored lights representing an equal number of units of energy. In color theory a great deal has been made of the relative limits of color sensitivity. Hering's theory, for example, demands that the boundary of the zone for red must coincide with the boundary for green, and the boundary for blue with the boundary for yellow. The final answer to this question cannot be given until an investigation is made with colors equalized in energy.

We began a quantitative study of the factors that influence the sensitivity of the retina to color three years ago. With the control of factors we had at that time, we could not, for example, duplicate by several degrees at any two consecutive determinations the limits of the zone of sensitivity to any color. The result of our study has been that we are now able with a given light-source to duplicate within a degree the results obtained at a previous sitting. We can also duplicate almost as closely the threshold values or the amounts of light required to arouse color sensation in the more sensitive parts of the retina. Details of this work are given in a series of papers to be published in the course of the present year, beginning with the April issue of the *American Journal of Psychology*.

Visual Sensations Caused by Changes in the Strength of a Magnetic Field. C. E. MAGNUSSEN, University of Washington.

The paper gives experimental data on the following points: (a) Verifying the observations made by S. P. Thompson and Knight Dunlap. (b) Ascertaining that the magnetic field induced while making and breaking a direct current gives a visual sensation. (c) Determining the threshold of the sensation in terms of ampere turns. (d) Determining the dependence of the sensation upon the frequency of the current. (e) No sensation other than the visual was noticed by any of the observers. No after effects appeared. For stronger fields, care should be exercised, as the sensations are of considerable intensity.

Local Signature and the Extensivity of Sensation. WILLIAM C. RUE-DIGER, The George Washington University.

The different theories that are advanced to account for the ability to localize points on the skin or in the visual field may apparently all be classified under three heads. These are (1) the kinesthetic theory, (2) the sensational-element theory, and (3) the sensational-complex theory.

According to the kinesthetic theory, localizations are made reflexly by the child, and the accompanying kinesthetic sensations give the needed data to consciousness for making localizations later. According to the sensational-element theory, every elemental visual and skin sensation has an inherent characteristic that varies with the particular end organ that is stimulated. According to the sensational-complex theory the sensations received from the elemental sense organs in the skin or retinas would be alike and the differences in local signs that we feel or see would be due to different combinations or complexes of these homogeneous elemental sensations.

The kinesthetic theory alone appears clearly inadequate (see Myers, *Experimental Psychology*, p. 239), and this leaves the choice to lie between the other two. The experiments that I have performed appear to point to the truth of the sensational-element theory. I have performed experiments with the Bloch instrument on the forearms of four subjects, using 1 gram of pressure in one series and 10 grams in another, and applying the pressures respectively to a vein and to the skin where no vein was in evidence.

Localization was just as accurate with one gram of pressure as with ten, and it was even more accurate on a vein than on the skin where no vein was evident. This is contrary to what one would reasonably expect according to the sensational-complex theory.

If it is true that there are innate differences in sensations corresponding to the points of the skin or retinas stimulated, the development of space perception may be readily accounted for. The assumption of sensational extensivity seems entirely unnecessary. Furthermore, this assumption, while insistently made by many psychologists, is not used by these psychologists in explaining or developing space perception.

Two New Sphygmographic Instruments. R. DODGE, Wesleyan University.

The first is a pneumatic photographic recorder of extremely low latency and high sensitivity. Used in connection with any good

microscope, it records vibrations of over 1,000 per second, shows overtones of vowels and heart tones, and gives pulse waves of any desired amplitude without changing its latency or other constants. Suitable for class lantern-demonstrations of pulse and plethysmographic changes, it is durable and practically fool-proof, at least for anyone who can use a microscope.

The second instrument cannot be shown in action. Used with a string galvanometer, it registers the pulse of a distant subject who is not hampered in his activities, provided he remains connected with the binding posts.

Some Recently Discovered Physiological Changes Attending Fear and Rage. W. B. CANNON, Harvard Medical School.

A close relation exists between adrenalin and the sympathetic system. The adrenal glands are caused to secrete when the sympathetic is stimulated, and adrenalin affects all structures innervated by the sympathetic as if they were receiving sympathetic impulses.

Major emotional disturbances (fear, rage) indicate the dominance of sympathetic impulses. In the cat, for example, fear or rage produces dilatation of the pupils, inhibition of the stomach and intestines, rapid heart, and erection of the hairs of the back and tail. Tests with excised intestinal strips (sensitive to adrenalin 1 to 20,000,000) prove that fear or rage causes also the adrenal glands to pour an increased secretion into the blood.

The persistence of the excited state of the body may therefore be due to chemical stimulation which continues the changes started by nervous impulses.

Injected adrenalin mobilizes sugar in the blood and results in glycosuria. Fear or rage has the same effect, if the adrenal glands are present. Emotional glycosuria can be evoked in a cat by permitting a dog to bark at it at close range.

Fear is related to the instinct to flee, rage with the instinct to fight (MacDougall). Possibly in the wild state emotions are useful in providing sugar as a source of energy, and adrenalin as a means of offsetting fatigue, in excessive muscular exertion.

Electrical stimulation of nerves innervating the adrenal glands, while a muscular fatigue curve is being written, increases (in some cases more than one hundred per cent.) the height of the curve.

A Contribution to the Physiology of Kinesthesia. (By title.) GEO. V. N. DEARBORN, Tufts College.

From an experimental study (begun in 1909) of the voluntary

(new and unrhythmic) movements of more than forty intelligent subjects (varying in age from fourteen to sixty-two, of both sexes, some blind and some with normal vision) the following conclusions issue, and they are supported by sundry outside evidence set forth in the paper itself:

1. Aside from the more or less passive indication of posture, resistance, equilibrium, vibrations, etc., the function of the conscious movement sensations is inhibition, the deliberate active restraint of tendencies to inaccuracy in voluntary action otherwise actuated.

2. Save in some "motiles," a series of voluntary movements perceived only kinesthetically is promptly visualized and then forms the conscious phase of the motor idea for the series' repetition. The motor idea of a truly deliberate movement is given, then, in visualizers as a partly conscious visual (*aut al.*) image in inseparable association with actuating kinesthetic coordinations wholly unconscious, which, lacking a better name, may be termed spinal kinesthesia. This motor idea is in practical opposition, in a sense, with the conscious kinesthesia, but the two may be fused by habitual effort.

3. The voluntary action of blindfolded "motiles" is like that of blind people, both having comprehensive conscious kinesthesia but usually at the expense of the accuracy of the general motor idea in visual and spinal kinesthetic terms.

4. The direction of a voluntary movement has no advance representation in the conscious kinesthesia and must therefore be determined in the combined visual and spinal-kinesthetic motor idea.

5. The extent of a movement, likewise, probably determined by the muscles and felt there, is presumably a function of the unconscious spinal kinesthesia. Hence Hollingworth's scepticism as to judgments of extent, and one or two of Woodworth's conclusions.

6. Motor skill, neurally speaking, consists especially in the power and habit of *fusing* in running control these two phases of kinesthesia—the actuating (unconscious) and the conscious inhibitory impressions on the voluntary cerebral resultant.

7. Voluntary movement as such, new and personal and difficult, is inherently an inhibitory process.

The products of this experimental study appear to make easier of understanding the duality of the pathway between the posterior lateral gray cord and the great cortex, one "kind" of kinesthesia (the inhibitory) going apparently with relative directness via the lemniscus, the other (the hereditary, spatial, impersonal, actuating influences) through the cerebellum, etc. These results seem also to

reconcile and help explain certain illusions and seeming inconsistencies in the relations of consciousness to various aspects of a voluntary movement.

The Value of Sublimating Processes for Education and Reëducation.

ERNEST JONES, University of Toronto.

The process denoted by the term "sublimation" is defined by Freud as "the capacity to exchange an original sexual aim for another no longer sexual aim, though a psychically related one." It has long been empirically recognized that undue sexual excitation can be relieved by diversion of the person's interests into other directions, such as those of sport, etc., and also that energy thus derived furnishes a not inconsiderable contribution to artistic and other social impulses. Two matters not generally recognized in this connection are these: What happens is not so much a *replacement* of one interest by another totally different one so much as the *displacement* of a given conative trend from one aim to another, more suitable one; the original trend or desire does not die, but undergoes a transformation in finding a different mode of expression. It is possible that the law of conservation and transformation of energy holds as well in the mental sphere as in the physical. Further, the diversion of normal sexual desire constitutes only a small part of what is included under the term "sublimation." Sublimation is more concerned with the socially useless and primitive components of the sexual instinct from which the adult form of sexuality is only a residuum left after an extensive process of repression of the rest. Accompanying this repression is the process of sublimation, which therefore is mainly a question of early childhood life. These discarded desires form the basis of many of our later acquired interests and activities, and it is maintained that a fuller knowledge of them would be of the greatest value to education by indicating the most fruitful paths along which sublimation could take place. It is at present to a great extent left to chance for a given educational topic to find some already existing potential interest in the child to which it can make an appeal, whereas if these potential interests were investigated and the nature realized of the energy which is at our disposal for educative purposes, then we should be in a position to apply them in the most profitable directions and thus make the best use of them for social purposes.

Several matters in connection with the reëducation of criminals, perverts, neurotic and insane patients are dealt with, and stress is laid on the application of the foregoing principles to the treatment of

advanced cases of dementia. Psychologically such patients are in a state of early childhood, and their activities are often confined to seeking long past sources of bodily pleasure. These activities should be correlated with the corresponding ones of infantile life, and the attempt to divert them into more suitable directions should be guided by a knowledge of the evolution they undergo in the normal child.

Apropos of the Doctrine of Reserve Energy. TOM A. WILLIAMS, Washington, D. C.

Using the conception of the subconscious as applying to a special series of nerve processes, energizing independently of those which are the bases of the thoughts of everyday life, a psychological theory has arisen that these subconscious processes constitute energies which may be regarded as a reserve susceptible of being utilized by means of special associationizing processes. On this basis a therapeutic method is employed.

This theory depends upon the postulate that the threshold of excitation is somewhat inversely proportionate to the richness in associations of the constellation to be excited. This postulate regards the inhibition of energy as synonymous with its storage, forgetting that inhibition itself is a greedy consumer of energy. So that the absence of manifestation of energy to a superficial examination at least, does not connote its storage on reserve on these grounds at least.

Nor is the fact that useful work is not done by any means an index that energy is not expended; for a very little observation shows that it is extended in fatuities and sterile activities.

So that for the principle of reserve energy would be more correctly substituted the principle of channeling energy in fruitful directions. The results of what is called training, that is, technical methods, clearly show this difference. The trained man may spend less energy than the untrained man, but his work is more effective in result because more wisely expended.

The Psychological Analysis of So-called Neurasthenic and Allied States. TRIGANT BURROW, Johns Hopkins University.

Etymologically, of course, neurasthenia means an exhaustion of the nerve structure. It is a fatigue-state constituted of chemical or molecular alterations of the substance of the neurones. Neurasthenia is then essentially an anatomical process. But is this definition of neurasthenia appropriate to the various aberrant states which are

at present universally subsumed under this generic head? Ought we longer to be satisfied with the prevailing static, neurological conception of this widely variable disease-complex, or ought we rather to press for a more restricted, individual, dynamic interpretation such as may be yielded through a psychological analysis of the particular case?

Cases of neurasthenia present symptoms which are noteworthy in respect to two important features: First, because of the lack of coherence and systematization, such as we are wont to demand in the recognized clinical disease-entities; and second, because of the absence of the objective morphological findings, such as might bear out the patient's subjective complaints.

In such a pass, we are clearly confronted with an apparent discrepancy, and in strict observance of established medical precepts, the neurasthenic ought accordingly to be excluded from the interest of the average physician.

To escape this alternative, neurology has invoked the conception of functional changes having their basis in disintegrations occurring within the elements of the nervous system, presumably so minute as to be impalpable to ordinary objective tests. The conception affords us a comforting subterfuge, but this is an insincere dodging of issues, unworthy of the scientific ideal.

Experience afforded by the use of the psychoanalytic method compels the recognition of important affective trends, such as seem ever insatiably pressing for satisfaction, and it would appear that in the event of obstruction to the natural course of such instinctive tendencies, there occur vicarious gratifications in unconsciously motivated reactions, such as are allied with the former through what may be called somatic associative connections. It is precisely such somatic associations that constitute in this view the so-called symptoms of the patient.

The phenomenon furnishing strongest support for this interpretation of many so-called neurasthenic states is the persistent reiteration of one and the same unconscious trend throughout a patient's dreams, as revealed upon analysis, and the very striking analogy between the psychological imagery of the patient as presented in his dreams and the *organic* imagery, as presented in his symptoms.

Considering the trend of these observations, are we not justified in bringing into question the prevailing neurological conception of so-called neurasthenic and allied states, and in view of the parallelism here indicated between the content of the patient's dreams and the

content of his objective symptoms, may we not regard the latter as also answering the purpose, as it were, of a physiological charade and as constituting like the dreams an associative or symbolic representation of an inherent biological trend, to which external circumstances have denied, perhaps, a normal fruition and which, therefore, seek an outlet in such unconscious, surrogate issues?

The Influence of Caffein on Mental and Motor Efficiency. H. L. HOLLINGWORTH, Columbia University.

Report of an elaborate experiment on 16 subjects for a period of 40 days, under controlled conditions of life, administration of doses, etc. The effect of single doses was traced for 72 hours after administration. The tests used were steadiness, rate of tapping, visual-motor coordination, typewriting (speed and accuracy), color-naming, naming opposites, calculation, size-weight illusions, cancellation, discrimination and choice reaction time, quality and amount of sleep. Motor tests show quick and transient stimulation. Association tests show stimulation which comes more slowly and persists longer. Tests of discrimination and coordination show similar stimulation, which may be preceded by retardation due to false reactions and consequent caution. No sleep disturbance for doses smaller than 4 or 6 gr. of pure caffein alkaloid. The magnitude of the caffein influence varies inversely with body weight, is reduced and delayed when the dose is taken along with food substance, and is relatively slight when the dose is taken in the morning. There is absolutely no evidence of any secondary depression or retardation following upon the stimulation. Full reports of the investigation appear in the January numbers of the *American Journal of Psychology*, the *PSYCHOLOGICAL REVIEW*, the *Therapeutic Gazette*, and in the *Archives of Psychology*, Columbia Contributions to Psychology, No. 21.

*A Kinetic Will Test.*¹ GUY G. FERNALD, Concord Reformatory.

In selecting and devising psychological tests to be applied in the differentiation of defectives, especially among delinquents, it is important to test the ability to endure for the sake of achievement. This function complex may be measured in terms of fatigue in units of time.

Fatigue is naturally and rapidly induced in a subject who stands with heels about 1 cm. off the floor. Incentive to endure is sup-

¹This test is to be known henceforth as "An Achievement Capacity Test."

plied in the stimulus and in visualizing the degree of elevation of the heels by means of a delicately energized indicator on a dial before the subject's eyes which faithfully magnifies the amplitude of the fluctuations of the heels.

This test has been applied to 116 Reformatory prisoners and to 12 Manual Training school students. The disparity of lowest and highest scores is remarkable—*i. e.*, $2\frac{1}{2}$ and $52\frac{3}{4}$ minutes in the former group and 12 minutes and $2\frac{1}{2}$ hours in the latter—and the difference of the average and median for these two groups is 35 minutes, about twice the average of the Reformatory group.

It is essential that the limit of mental persistence be reached before the limit of muscular resistance is encountered, and experience shows that this form of the test realizes that desideratum. No subject involuntarily rested his heels while still striving; but each decided to yield. This was the universal observation both objective and subjective.

The disturbing elements of varying training and body weight are almost nugatory, as in male subjects of nearly uniform age the coefficient of correlation of the development and strength of the musculature involved to the body weight would be direct and very high.

The Adaptation Board. HENRY H. GODDARD, Vineland Training School.

The ability to adapt one's self to changed conditions is something that comes with developing intelligence and young children possess it only in a slight degree or not at all. Feeble-minded persons who are arrested in their development so that they have the mentality of young children of various ages, show markedly this lack of power of adaptation. In order to measure if possible this lack, the Adaptation Board has been devised.

It consists of a board a centimeter thick, 22×28 cm. with four holes placed near the corners, three of these being 63 mm. in diameter while the fourth is 65 mm. A circular block is provided large enough to just fill the largest hole, therefore too large to be placed in either of the others.

The Test.—It will be noticed that the difference in the size of the holes is too slight to be detected by the eye.

The board is placed in front of the child in such a position that the hole into which the block will fit is in the upper left hand corner. The child is then made to discover which is the only hole into which

the block will fit. After trying this several times until he can show without hesitation the correct answer to the question, "which is the only hole into which the block fits," he is given the block and told to watch what happens. The board is then turned over from his left to his right and he is asked then to put the block into the only hole into which it will fit. The child of sufficient intelligence, of course, puts it in the upper right hand hole; if of lower intelligence, he tries it still in the upper left hand hole because that was what he had learned and he has not been able to adapt himself to the changed condition, even though he was watching the change.

For the second part, the board is now placed in its original position and the child shown again that now it is in the position where the block fits the upper left hand hole. He is then told to watch. The board is now inverted, the edge farthest from him being brought toward him, and he is now asked to put the block into the only hole into which it will fit.

Here are shown at once three types of children. The intelligent child places it, of course, in the lower left hand hole; while the child who is totally unable to adapt himself or to learn, tries it still in the upper left hand. There is, however, an intermediate group of children, who, while not able to adapt themselves to the exact condition, remember that on the former occasion, after being told to watch what happened, the block went into the upper right hand hole, and they therefore now try to put it there.

Report of Experiments at Bedford Reformatory, 1910. (By title.)

E. H. ROWLAND, Mt. Holyoke College.

Nine psychological tests of reaction-time, memory, attention, and suggestion, were performed on 35 women in the N. Y. State reformatory at Bedford. The object of these tests was to find out whether the resulting grades would be an index of the ability of the subjects, and whether those failing to pass a certain number of the experiments could be fairly judged as unable to earn their own living after their term was over. Failure in 6 out of 9 tests was called sub-normality. Eleven of the thirty-five failed to reach this standard. These already comprised the list of those graded by the superintendent as sub-normal and incapable of honest freedom, with the addition of two more who failed only in 5 tests.

The experiments were later tried upon Mt. Holyoke and Amherst students. No student failed in 6 tests.

The Present Status of the Binet-Simon Tests. J. E. WALLACE WALLIN.

The reader discussed four methods by means of which to check up the accuracy of measuring scales of intelligence: (a) Extensive surveys of normal children in each age by a wide-range system of testing, to ascertain whether the age norms are correct, as determined by the percentage of passing and the size of the MV's; (b) annual tests of the same groups of normal children, to determine whether the amount of actual growth corresponds to the growth norms laid down in the scale; (c) the plotting of curves of frequency for homogeneous groups of individuals, to determine whether the curves assume the normal shape for chance distributions; and (d) the plotting of efficiency or capacity curves for each age for the various traits tested in the scale, or for traits tested independently of the scale, to determine whether the capacities increase in strength with age and whether they vary within the limits of the maximal permissible norm of variation.

An analysis by these methods of the available experimental data of various workers in different countries indicated that there are various inequalities and imperfections in the 1908 Binet-Simon scale, both in respect to the placement of a considerable number of individual tests and the correctness of several collective age norms. But it also appeared that, in spite of obvious inequalities, the scale possesses considerable value as an instrument for gauging mental station and classifying groups of mental defectives. Several objections to the 1911 scale were offered, and a plea was made for more extensive wide-range try-outs of the 1908 scale by uniform and standardized methods on normal school children, before any American revisions should be attempted.

The Status of the Binet Tests to Date. HENRY H. GODDARD, Vineland Training School.

The *a priori* arguments against the tests were considered, and some cautions noted.

A summary of the results of their use brought to light these facts: The results of the tests applied to 400 feeble-minded children agree perfectly with long experience in institutional life. A second testing on the same group shows remarkable agreement with the first. 2,000 normal children tested by this method show the remarkable curve of distribution; and the results agree very closely with the experience of the teachers. 1,000 of these, retested a year later, again

show considerable correlation with the earlier test, but with marked and peculiar differences which must be explained. A test of 56 delinquent girls in Boston shows 52 of them mentally defective according to the scale. These are the girls that have given the most trouble to the probation officers. 100 Juvenile Court children in the Detention Home in Newark, N. J., show 66 per cent. feeble-minded according to scale, and only one of normal intelligence. 100 children admitted to the Rahway Reformatory in New Jersey show 26 per cent. feeble-minded. The test of an entire private school in Pennsylvania showed results agreeing strongly with the experience of the teachers with one or two striking exceptions.

Feeble-minded children tested from two to seven times show remarkable uniformity in the results, largely regardless of the experience and personnel of the examiner. Some tests of the insane have shown that the method is of remarkable value in these cases, the difference in the results being that whereas normal and feeble-minded children nearly always answer all the questions up to a certain point and then stop, the insane, on the contrary, miss the questions in earlier years and do those that are for older people, indicating that the disease has destroyed certain processes without producing a leveling down of the whole intelligence. The same thing has been discovered from the use of the tests on epileptics at Skillman, N. J., indicating that epilepsy is a degenerative process.

Conclusion.—The tests go a long way toward giving us what we want. They are accurate far beyond belief. While it is true that they need supplementing and improving, yet it is quite possible that this supplementing will have to be in the nature of a consideration of individual cases and special tests for special children. It is a problem that may well occupy the attention of psychologists, but no one should attempt to criticize the tests until he has used them on some hundreds of children.

The Application of Experimental Psychology to the Problem of Vocational Guidance. HELEN THOMPSON WOOLEY, Cincinnati.

The present paper reports an attempt which is being made to test the usefulness of a psychological laboratory as a part of a vocational bureau. The bureau is established in connection with the office which issues working certificates to children in Cincinnati. The general plan of research is to follow for five years the careers of a thousand or more children who have left school at the age of fourteen to go to work, and to compare them with a corresponding series of

children who stay in school. The records cover the child's school career; his physical condition; his home conditions; his industrial history, including a study of the places of occupation; and his mental state as determined by the psychological examinations.

The considerations which guided the selection of tests were the following: (1) a series suited to the capacity of 14-year-old children who have completed at least the fifth grade; (2) a series which would help to analyze the fundamental aptitudes of the child; (3) a series which could be administered in about an hour's time; (4) tests which could be quickly evaluated; (5) a series in which the disturbing effects of communication between children who have been tested and those who have not, can be minimized, partly by selecting tests which are very little modified by previous knowledge of their nature, and partly by selecting those whose form can be changed without changing their value; (6) tests requiring only inexpensive apparatus.

The series now in use is the following. (A) For Sensation: (1) Visual acuity taken with the Snellen Chart, and (2) auditory acuity taken with the tick of a stop watch. These tests reveal nothing more than the presence of abnormalities which might have a hampering effect. (B) For motor ability: (1) The strength of the hand taken with an adjustable dynamometer, (2) the rapidity of movement in tapping, (3) the rate of fatigue in tapping, (4) the steadiness of the hand, taken with the apparatus described in Whipple, page 124, and (6) coördination as tested by card sorting. (C) For perception: The quickness and accuracy of perception, as revealed in the *A* test. (D) For the higher mental faculties: (1) Immediate memory for digits, (2) learning power, taken with a special form of substitution tests, (3) the use of language, and range of ideas, tested by association of opposites, and by completion of sentences, (4) ingenuity taken with a form board test. The speaker discussed the exact method of giving each test, and of evaluating results.

An Objective Measurement of Handwriting. D. STARCH, University of Wisconsin.

The proposed method of measuring handwriting consists in measuring, by means of a celluloid graphometer, the mean variation of the slant of letters and their mean deviation from the base-line. These two measures are reduced to the same units of linear distance and averaged. In this manner all the samples in Thorndike's scale were measured which showed that the uniformity of letters regularly decreases as the quality of the writing decreases. Measurements

of other specimens of writing made by this proposed method and by the method of direct comparison with standard specimens showed that the former method is considerably more accurate. The application of this graphometer scale to various problems of research was illustrated in the measurement of a considerable number of specimens of writing from pupils in the second grade to the last year in the high school. This yielded a curve of learning reaching its maximum point of excellence in the seventh grade.

Relative Time and Accuracy in Adding Upward and Downward.
(By title.) L. W. COLE, Boulder, Colorado.

Measured by averages, twenty-nine out of a group of thirty persons, selected at random, added the same problems more rapidly and less accurately when adding upward than when adding downward. Counting to the left was also slower and more accurate than counting to the right. This is apparently due to a habit acquired by reading from right to left. In both experiments the factor of habit seemed to produce a saving of time at the expense of accuracy. The subjects of the experiments were persons of average practice in adding. Probably a very great amount of drill in addition (perhaps more than a school program could allot to it) would be required before a different type of results would emerge and the adding process become both mechanical and accurate. This paper will be printed in the *Journal of Educational Psychology*, Vol. III., No. 2, February, 1912.

Montessori's Method of Teaching Writing and Reading. HOWARD
C. WARREN, Princeton University.

The Casa dei Bambini is an important modification of the Kindergarten originated by Maria Montessori in 1907. The pupils range from 3 to 7 years of age.

Besides sensory and intellectual training the program includes lessons in deportment and self-help, gymnastics, manual training, play, and nature study. The scheme of studies is founded on an unusually correct appreciation of the child's mental processes. Motor habits are developed from instinctive motor tendencies; habits of thought are built up by association. The theory of discipline is novel: the children are subject to no drill; and there are no extrinsic rewards or punishments. A cardinal principle in the method is the brevity of the instructions given.

Writing and reading are the culmination of a long series of sensory and muscular training. Touch and the kinæsthetic sense are em-

phasized. The child learns to distinguish blind-folded between silk, velvet, satin, wool, cotton, and linen, and between different grades of texture in each. The sense of form is taught in the same way.

The teaching of writing falls into three stages: practice in holding and wielding the pen; exercises in associating the tactual-motor form of a letter with its name and visual form; and combining of letters into syllables and words. On account of the careful preliminary training in the motor equivalents these children form letters more accurately at 5 and 6 than the ordinary child of 10 or 12 who has learned to write by imitating visual copies.

In the new system reading follows writing instead of preceding it. The children already know how to read detached words; but according to Montessori this is not really "reading." They are first trained to recite in unison sentences written on the blackboard. At length something is written which involves *action*. When the children understand and obey the directions, reading attains its true value. It is no longer merely mechanical expression, but a means of acquiring ideas. The change comes when the impulse to read aloud is checked.

The program and methods of these schools challenge our entire system of both primary and secondary education. They indicate that the present curriculum needs thorough revision. It is founded on a faulty psychology; it does not consider what a child is fitted to assimilate at any given stage of mental development. Montessori's system is based on a study of precisely these problems.

(This paper will appear in full in the March number of the *Journal of Educational Psychology*.)

The Relation between Amount to be Learned and Retention. V. A. C. HENMON, University of Wisconsin.

Ebbinghaus, in the widely quoted results on the relation of the length of series to the number of repetitions required for learning, found that the number of repetitions increases at first with very great rapidity and then less rapidly and that the increase in repetitions is relatively greater than the increase in the length of series. A systematic investigation of the problem in learning nonsense-syllables, poetry and prose has failed to confirm the law. On the contrary, there is a relative decrease in the number of repetitions as the length of series increases and an increase in retention after an interval of time. This result holds not only for practiced but also for unpracticed subjects and is most marked with sense material.

The Relation of Facility in Learning to Tenacity of Impression. E. A. MCC. GAMBLE, Wellesley College.

Question 1.—Do the persons who learn with the greater facility retain for a given time the larger fraction of the material severally mastered? The results in point have been obtained with series of words, letters and figures, by the method of retained members, from about 350 college students. Tenacity was gauged by the number of series members which could be produced without a fresh presentation of the series, with a single presentation and after several presentations. The results show no correlation, either positive or negative, between facility and tenacity.

Question 2.—In the case of individual subjects, does the rate at which material is presented affect the fraction of the initial learning time which is saved in relearning?

Question 3.—When the learning time is lengthened by the difficulty of the material is the relearning time relatively short or relatively long? The results bearing upon these two questions have been obtained from trained subjects, with normal series of nonsense syllables, by the method of complete memorizing and with aural presentation. When series are learned and relearned at the same rate of presentation, the fraction of the learning time saved in relearning is greater if the presentation rate is neither very slow nor very fast. When the series are learned at different presentation rates but relearned at the same rate, the fraction of the learning time saved is greater for the series which were originally learned at the slow rate of presentation, unless the absolute learning time of the "slow series" is very small. Series which are hard to learn are more often hard than easy to relearn.

Question 4.—How may retention best be gauged? The method of reproduction without fresh presentation is unsatisfactory because it reveals only the strongest of the original impressions, the "supraliminal associations." The method of relearning is unsatisfactory because in relearning it is impossible to distinguish facility in forming fresh associations from retention of subliminal associations. The method of reproduction after a single presentation is perhaps most satisfactory. The small amount of work done on this plot in the field of memory investigation may be due to its hedge of experimental difficulties.

The Relation of the Quickness of Learning to Retentiveness. DARWIN OLIVER LYON, Columbia University.

Do those who learn quickly remember the longest? Those who

have attempted to answer this question experimentally have obtained results that do not agree. Close inspection proves the problem to be a very elaborate one, for the results depend upon nature and length of material used as well as on age, sex, condition, etc., of the subject. Most important of all is the method used in ascertaining the subject's "retentiveness" after the lapse of the time interval chosen. Roughly speaking we may say that those who learn quickly remember longest where the material used is "logical" or "meaningful" in character, but forget quickest where the material is such as involves the memorizing of motor associations, which is generally the case with digits, words, and nonsense syllables. We can state quite positively that the amount of difference in retentiveness between the fast learner and the slow learner is much less than is generally believed.

Plateaus in Simple Learning. JAMES E. LOUGH, New York University.

The present study deals with the determination of the habit curve in the field of a simple visual association. The material for the test consisted of 3 sheets: (1) A test sheet with 10 lines of letters in mixed order; (2) a key sheet, in which 20 letters used in the test sheet are arranged in a vertical column and opposite each is printed some other letter; (3) a record sheet. The method has been described in detail in my previous reports and in Kirkpatrick's "Studies in Learning," *Archives of Psychology*, 1909. I have used this method since 1902 as a class test and as an individual test, and have collected over 500 records including adults and children. Some of these tests were made as home tests and some as laboratory experiments under carefully controlled conditions. No difference can be observed in the results of tests made under these two conditions.

These tests are made in order to study habit formation as affected by (1) practice, (2) fatigue, (3) distribution of repetition, (4) diurnal efficiency, (5) changing keys, (6) sex, (7) age, (8) ability, and (9) individual variation. I expect shortly to publish with Dr. P. R. Radosavljevich, under the title "Habit-Formation in the Light of Experimental Investigation," a detailed report of this study. At this time I wish to say only a few words with reference to the problem of plateaus as indicated by my experiments.

As it is known Bryan and Harter were the first who found in their study one or more special periods of delay in progress, so-called "arrest periods," "critical stages," or periods of "incubation," giving

a "plateau" or two in curve, where certain elementary habits make substantial gains, preparatory to their organization. In my tests in simple associative learning, where only one or a simple group of special associations are formed no "plateaus" occurred. The practice period in these tests lasted from 20 to 90 days.

The habit curves all agree in type; showing (1) a more or less concave form; (2) general increase of quickness of response; (3) certain irregularities. These irregularities, however, are not plateaus but are normal small irregularities due, as introspection proves, to regular and irregular fluctuations in attention and effort, to fatigue, to "breathing" factors, or to some inner or outer incident; the secondary causes of these irregularities are in some cases the time of day, weather, temperature changes, etc. The majority of subjects claim that those irregularities are due to fatigue, because even in a single test (10 trials in each group) in the 5th and 7th trial there is usually little or no gain, and sometimes a loss.

The nature of learning in these experiments is much simpler than in the experiments of Bryan and Harter, Swift, and Book, and my failure to discover plateaus would seem to indicate that this feature of the learning process is confined to the more complex activities.

Some Experimental Evidence on the Transfer of Training in Memory.

E. E. RALL, University of Tennessee.

This is a report of experiments with 44 students at the University of Texas in 1909 and 1911. A memory test on lines from "Evangeline" and nonsense syllables was given for three days before and after a training period which lasted four weeks and averaged 20 minutes a day. The training material was varied for different individuals, and included poetry and prose in English and foreign languages, irregular verbs and vocabularies. The time for the first three and the last three days of the training period was used to measure improvement or loss, the same amount having been memorized each day. Parallel control experiments, involving 28 observers, were carried on in both years, using only the tests.

The results showed wide variations: 4 out of 44 lost in the training, one lost in the "Evangeline" tests and 6 out of 34 in the nonsense syllable tests. In the control series 4 out of 28 lost in "Evangeline," 3 out of 16 in nonsense syllables. In the training 22 improved more, 20 less than in the "Evangeline" test; 2 improved the same in both, and 23 out of 34 improved more (or lost less) and 11 improved less in the training than in the nonsense syllable tests.

Taking the average of all gains and losses, the 25 observers in 1909 gained 32.5 per cent. in training, 26.9 per cent. in "Evangeline," 24.5 per cent. in nonsense syllables; while the 20 control observers gained 17.8 per cent. in "Evangeline" and 12 per cent. in nonsense syllables. Deducting the amount of gain in the control observers from that shown in the practiced group and calculating the percentages on the basis of the amount of material learned in a given time, it appears that there was, on an average, 21 per cent. transfer in "Evangeline" and 36 per cent. in the nonsense syllables. A smaller percentage of transfer is shown in the 1911 series.

CONFERENCE ON THE RELATIONS OF PSYCHOLOGY AND MEDICAL EDUCATION

1. *The Present Status of Psychology in Medical Education and Practice.* S. I. FRANZ, Government Hospital, Washington, D. C.

Psychology has recently grown in favor in connection with medical affairs. This has been due to the realization of the importance of psychiatry, and of the success of non-medical healers. In present-day medical education, *psychology* has a place in few departments of medicine, but in most schools *psychological matters* are discussed in the courses in physiology, psychiatry, neurology and medicine.

All physicians depend upon the account of mental processes for diagnostic information and for the estimation of the effects of remedial agents. In the consideration of mental diseases psychology has its greatest value to the physician, both in diagnosis and treatment. The general conceptions of the latter are inadequate, and usually too exclusive.

Psychology has value in research in psychiatry and neurology, and its principles have also been applied in pharmacological studies.

Technical psychology and its terms have been criticized by physicians, and it has sometimes been assumed that no special instruction is necessary, but if its general relations are to be understood some special attention to it is needed.

2. *The Value of Psychology in Psychiatry.* ADOLPH MEYER, Johns Hopkins Medical School.

It is necessary to consider the fields of both psychiatry and of psychology as open to expansion. There is a psychology which will cope not only with the problems of introspection, but also with the other problems dealing with the biological, physiological and even anatomical conditions of mental life. Who but the psychologist

would be qualified to deal with the broad field between the physiology of special organs and the behavior of personalities? Psychiatry has at all times tended to share the prevailing psychological attitudes. It inevitably has common ground with psychology, and to agree on the common ground or even on how we should want to characterize it is a vital issue for a discussion of the mutual value of two fields of work.

Psychiatry is *forced* to deal with psychological material and the more satisfactorily it does it, the better for both psychiatry and psychology. It determines mental facts partly as symptoms of diseases back of the conditions and partly as biological reactions of the type of mental integration, which, like suggestion, once induced, play a more or less well defined dynamic rôle.

The first task is to describe critically the plain events of abnormal reactions and conduct, as experiments of nature for the conditions under which they occur, the subjective and objective characteristics which allow us to differentiate the reactions from one another, the events and results in the conduct and life of the person, the dynamic factors and their modifiability, the time and influences needed for a readjustment of a state of balance. With this rule of formal technique and logical arrangement of the inquiry we are bound to get sound common ground for a psychiatry which aims merely at the identification of given conditions with accepted disease-processes and *also* for a dynamic pathology which gives psychobiological data a dynamic position.

With regard to the program developed by Dr. Prince, I feel that the college curriculum should not preëempt the field of psychopathology unless it has clinical material on which to work and on which to obtain the facts under discussion. Common-sense psychology offers enough problems for sound psychology at that stage. In the medical curriculum he would expect the program of Dr. Watson (including the study of instincts, work and fatigue and sleep) to be added to the physiology course in the second year (or the first year if the physiology of the nervous system can be made to precede); the course of pathology would then have to give space to the elements of psychopathology (effects of drugs, of glandular action, hypnotism and the collisions of attitudes and emotions, and their effects on memory). The third year would extend into the field of substitutions of the hysterical and psychasthenic type, and simpler psychotic reactions, and to the aphasia-apraxia group. The fourth year would then be prepared to cover psychopathology and psychiatry as it appears in the clinical work and in clinical research.

3. *Psychopathology and Neuropathology: The Problems of Teaching and Research Contrasted.* E. E. SOUTHARD, Pathologist to the Massachusetts Board of Insanity.

The ideas that I wish to bring to this symposium are few, and I hope not too unorthodox. How shall research psychology and research medicine come together, on what ground, and to what ends? I wish (1) to insist strongly on the unique value of the pathological method, not merely for the diagnostic and therapeutic purposes of medicine, but for biology as a whole and for the most vital of biological sciences, psychology. I wish (2) to point out how pernicious in research may be the dogmatic insistence on the doctrine of psychophysical parallelism in medical or premedical courses in psychology, pernicious because it inhibits the free interchange of structural and functional concepts and the passage to and fro of workers in the several sciences. I wish (3) to show that psychology and physiology have more in common than either has with such structural sciences as anatomy and histology, and that the main common element of both mental and cerebral processes is the time-element as against the space-element of the structural sciences. On this ground (4) I conceive that the mind twist and brain spot hypotheses for the explanation of certain forms of mental disease are entirely consistent with each other, since from a different angle each is dealing with the same facts. (5) Above all let us not divide up the tasks of research as we divide up the tasks of teaching, since research, looking to the future, defies the compartments of the past.

4. *Content of a Course in Psychology for Medical Students.* JOHN B. WATSON, Johns Hopkins University.

The proposed course should concern itself largely with the objective material of psychology. It should include a brief course in visual and auditory sensation, thorough tests and applications of the Binet-Simon system, and work in mental and muscular fatigue. The greater part of the time in the course should be devoted to experimental studies in the acquisition and retention of skillful acts, since this type of experimentation will show the methods and the different stages of acquiring accommodations, the distribution of effort in learning, short cuts in learning, etc. Such experiments pave the way for the normal understanding of lack of interest at certain stages of development, as shown in "resting places" and "plateaus"; the understanding of "bungling" and "conflicts"; the stamping in and retention of wrong methods of response and the effect of emotional states upon the acquisition and exercise of habit.

This work on habit formation should be followed by a study of the normal process of association, memory, and retention. These studies should be purely objective. Definite tasks should be set; words, phrases and various other material presented, then the time of learning under ordinary conditions and under conditions of excitement, obtained by rushing, interruption, etc., should be taken. The student will see that the rate of learning and the errors in learning can be measured as any other biological function can be measured. Memory in the narrower sense ("associations" with time, place, and emotional setting) can very easily be tested by the picture method or by the method of presenting concrete situations, now largely used in Germany in the psychological training of students of law.

This work on memory in the narrower sense may be greatly supplemented by the introduction of Jung's association method.

It is the view of the writer that the course should contain several lectures and experiments upon normal reaction time. It is unsafe and unwise to put a stop-watch in the hands of the medical student without at the same time telling him a little about the factors which influence reaction times, their normal variability especially in untrained subjects and the individual peculiarities of different subjects in this and other respects.

By these lectures and experiments upon the above subjects it is thought that the student will be prepared to enter the clinic, where he should find the means of broadening his knowledge of hypnotism, multiple personalities, suggestion, aphasia. Only in the clinic can be obtained the material for such study. Without the individual study of cases all lecture work is unavailing. It is the psychopathologist's function, and not the psychologist's, to teach such subjects. The study of the "subconscious" should be excluded; nothing is gained by this concept. The visible and tangible effects of suppressions, tangles, conflicting habits and the like, may be studied without positing a subconscious. Such a concept is as detrimental to the advancement of psychological analysis as is the discussion of those philosophical remnants—psychophysical parallelism and interaction.

The course might be given as an elective in the second or third year of the medical work. Two laboratory periods of two hours each and one lecture should be given. A thorough course in elementary psychology is presupposed as a part of the student's pre-medical training.

BOOKS RECEIVED FROM NOVEMBER TO JANUARY

- SCOTT, W. D. *Increasing Human Efficiency in Business*. New York: Macmillan, 1911. Pp. v + 339. \$1.25 net.
- [ANON.] *Life, Love and Light*. New York: Macmillan, 1911. Pp. viii + 177. \$1.10 net.
- BERGSON, H. *Laughter. An Essay on the Meaning of the Comic*. (Authorized trans. by C. Brereton & F. Rothwell.) New York: Macmillan, 1911. Pp. vii + 200. \$1.25 net.
- ROYCE, J. *William James and Other Essays on the Philosophy of Life*. New York: Macmillan, 1911. Pp. ix + 301. \$1.50.
- BARRETT, E. B. *Motive-force and Motivation-tracks*. London: Longmans, Green, & Co., 1911. Pp. x + 225. 7/6 net.
- MCDUGALL, W. *Body and Mind*. London: Methuen & Co., 1911. Pp. xix + 384. 10/6 net.
- EULENBÜRG, A. *Sadismus und Masochismus*. (2. Aufl.) Wiesbaden: Bergmann, 1911. Pp. 106. Mk. 2.80.
- FRIEDMANN, M. *Ueber die Psychologie der Eifersucht*. Wiesbaden: Bergmann, 1911. Pp. vii + 112. Mk. 3.
- URTIN H. *L'Action Criminelle. Étude de philosophie pratique*. Paris: Alcan, 1911. Pp. 268. 5 fr.
- HOLMES, S. J. *The Evolution of Animal Intelligence*. New York: Henry Holt & Co., 1911. Pp. 296.
- BOTTI, M. *L'Infinito*. Genova: Formiggini, 1912. Pp. 529.
- EUCKEN, R. *Life's Basis and Life's Ideal. The Fundamentals of a New Philosophy of Life*. (Widgery, A. G., trans., introd.) London: A. & C. Black, 1911. Pp. xix + 377. \$2.50 net.
- BALDWIN, J. M. *Thought and Things. A Study of the Development and Meaning of Thought or Genetic Logic*. Vol. III. New York: Macmillan, 1911. Pp. xvi + 284. \$2.75 net.
- ROUSTAN, D. *Leçons de philosophie. I. Psychologie*. Paris: Delagrave, 1911. Pp. 520. 5 fr. 50 net.

- STERN, W. *Die differentielle Psychologie in ihren methodischen Grundlagen.* Leipzig: Barth, 1911. Pp. xi+503. Mk. 12
- NEIL, T. F. *Whence and Whither or The Evolution of Life.* Altoona, Pa.: Mirror Printing Co., 1911. Pp. 62.
- HENRY, M. C. *Sensation et Énergie.* Paris: Hermann, 1911. Pp. iii + 296. 8 fr.
- HENRY, M. C. *Mémoire et Habitude.* Paris: Hermann, 1911. Pp. iii + 116. 3 fr.
- FICHTE, J. C. *Die Anweisung zum seligen Leben.* Leipzig: F. Eckardt, 1910. Pp. xii + 205. 2 Mk. 50.
- OEHLER, R. *Nietzsche als Bildner der Persönlichkeit.* Vortrag gehalten am 16 Oktober 1910 im Nietzsche-Archiv zu Weimar. Leipzig: F. Meiner, 1911. Pp. 31. 60 Pf.
- BUSSE, A. *Aristoteles Ueber die Seele.* Leipzig: F. Meiner, 1911. Pp. xx + 120. 2 Mk. 20.
- WALLIN, J. E. W. *A Practical Guide for the Administration of the Binet-Simon Scale for Measuring Intelligence.* (Reprint from *The Psychological Clinic*. Obtainable from the author.) Pp. 22. 15 cents.
- ANGELL, J. R. *Chapters from Modern Psychology.* New York, Longmans, Green, and Co., 1912. Pp. vii + 308. \$1.35 net.

NOTES AND NEWS.

DR. EDMUND B. HUEY, who has for some time been making examinations of defective children and of aphasic patients at the Johns Hopkins Hospital, has been appointed lecturer on mental development in the Johns Hopkins University and assistant in psychiatry in the Phipps Clinic of the Johns Hopkins Hospital. From January to June, 1912, Dr. Huey will give, at the university, a series of weekly public lectures and clinics on the subject of backward and feeble-minded children, and on related phases of clinical psychology.

PROFESSOR S. P. HAYES, of Mount Holyoke College, has been granted leave of absence and will spend the coming semester in England.

PROFESSOR R. S. WOODWORTH, of Columbia University, is planning to spend a semester's leave of absence in visiting the Psychological Institutes of England and Germany.

PROFESSOR HUGO MÜNSTERBERG, of Harvard University, is giving a course of eight lectures at Union College as incumbent for 1912 of the Ichabod Spencer Lectureship in Psychology.

THE following items are taken from the press:

DR. G. STANLEY HALL, president of Clark University, delivered the address at the inauguration of Dr. George E. Myers, principal of the State Manual Training Normal School at Pittsburg, Kansas. The subject of the address was "Educational Efficiency." During the month of January President Hall gave a course of six lectures on "The Founders of Modern Psychology" at Columbia University.

It is stated in the *Journal* of the American Medical Association that Professor Theodor Ziehen, director of the psychiatric and neurologic clinic in Berlin, will resign his position at the end of the winter semester and discontinue all medical work, in order to devote himself exclusively to research in psychology. For this purpose, he will remove to Wiesbaden, where he will erect for himself a private psychological laboratory.

DR. ALEXANDER F. CHAMBERLAIN, hitherto assistant professor, has been promoted to a full professorship in anthropology at Clark University.

PROFESSOR J. McKEEN CATTELL, of Columbia University, addressed the Huxley Society of the Johns Hopkins University on December 20, his subject being "Some Problems of University Administration." On the morning of January 19 he gave the foundation address at Indiana University. In the afternoon he spoke before the faculties on "Grades and Credits," and in the evening addressed the Society of Sigma Xi. On January 22, he gave an address before the faculties of the University of Illinois on "The Administration of a University." On January 5, Professor Cattell gave an address at Lehigh University and in the evening addressed the faculties of Lehigh University and Lafayette College.

A NEW psychological review, *Psiche*, has been launched in Italy with Professor Enrico Morselli of Genoa, Professor Sante de Sanctis of Rome, and Professor Guido Villa of Pavia as directors, and Dr. Roberto Assagioli of Florence as editor-in-chief. The directors aim to make the new review different from previous reviews in certain respects, one of which will be the devotion of each number to a particular topic. It is planned to publish six numbers of not less than sixty-four pages each in the course of the present year. The subscription price is L. 8 for Italian and L. 10 for foreign subscriptions. Single numbers will cost L. 2. Communications may be addressed to Via degli Alfani, 46, Florence.

THE PSYCHOLOGICAL BULLETIN

GENERAL REVIEWS AND SUMMARIES

SENSATION (GENERAL)

BY PROFESSOR MADISON BENTLEY

Cornell University

Minkowski (5) denies the validity of Müller's law of specific sense energies. He finds that the law is inconsistent with the concept of the adequate stimulus, and that it fails also to allow, if taken in strictness, the attribution of qualitative differences to the world of objects. Moreover, he finds Müller inconsistent in applying the law to the modalities of sense while conceding that stimulus may condition the individual qualities (colors, tones, etc.) within a single modality. Minkowski brings the argument from phylogeny to show that nervous system and end-organ have grown up under the influence of the environment and that they have been moulded in conformity to the properties of stimulus. The specificity of response he refers to Nagel's "specific disposition" which tunes the sensory apparatus, from the start, to a particular form of stimulation. A. Schönberg (6) thinks, on the contrary, that the doctrine of specific energies may be retained by assuming a relatively small number of nervous elements which respond differently under different intensities of stimulus. From the observation that strong taste stimuli often yield not one but two or three taste qualities, he draws the wide inference that "with every quantitative change of stimulus there is correlated a qualitative change in sensation." Schönberg cites other sense modalities, too; but he quite fails to support his generalization. Structures found within several of the sense-organs and known to the histologists as "secondary sense-cells" are thought by Botezat (1) to be of a glandular nature and to facilitate, by their

secretions, the excitatory functions of the end-organ. Botezat calls them "sensory gland-cells" (*Sinnesdrüsenzellen*). He includes the auditory cells of the labyrinth, rod-cells of the taste-buds, the cells in the rod-cone layer of the retina, and other similar structures. Upon his view, the stimulus sets these cells secreting, and their products act chemically upon the nervous substance. By treating the stimulating agents in an animal's environment under the principle of the parallelogram of forces, Szymanski (7) seeks to work out the relative physiological values of light, heat, etc., as these stimuli simultaneously affect the organism. The rate and direction of movement under combined stimuli are regarded by his method as resultants to be factored into stimulus-moments. From a brilliant series of experiments under the method of training (*Dressurmethode*), Kalischer (3) concludes (1) that the labyrinth is not an organ of analysis, (2) that the vestibule possesses auditory functions, and (3) that the cortex is not the sole seat of auditory and visual processes. Kalischer trained dogs to associate the taking of food with certain tones, odors, and colors. When the association had become fixed, the animal suffered an operation (such as the removal of the labyrinth or of the temporal or occipital lobes). From the subsequent retention or loss of the trained response the experimenter drew his inferences regarding the psychophysical processes involved. The brief account of the experiments leaves one in doubt whether sufficient precautions were taken against secondary cues. The method of training has for some time been used in this country by S. I. Franz (2) in his study of cerebral functions.

REFERENCES

1. BOTEZAT, E. Ueber Sinnesdrüsenzellen und die Funktion von Sinnesapparaten *Anat. Anz.*, 1910, 37, 513-530.
2. FRANZ, S. I. On the Functions of the Cerebrum: Concerning the Lateral Portions of the Occipital Lobes. *Amer. J. of Physiol.*, 1911, 28, 308-317.
3. KALISCHER, O. Weitere Mitteilung über die Ergebnisse der Dressur als physiologische Untersuchungsmethode auf den Gebieten des Gehör-, Geruchs- und Farbensinns. *Arch. f. Physiol.*, 1909, 303-322.
4. MACH, E. Sinnliche Elemente und naturwissenschaftliche Begriffe. *Arch. f. d. ges. Physiol.* (Pflüger), 1910, 136, 263-274.
5. MINKOWSKI, E. Zur Müllerschen Lehre von den spezifischen Sinnesenergien. *Zsch. f. Sinnesphysiol.*, 1911, 45, 129-152.
6. SCHÖNBERG, A. Beziehungen zwischen der Quantität des Reizes und der Qualität der Empfindung. *Zsch. f. Sinnesphysiol.*, 1911, 45, 197-203.
7. SZYMANSKI, J. S. Ein Versuch, das Verhältnis zwischen modal verschiedenen Reizen in Zahlen auszudrücken. *Arch. f. d. ges. Physiol.* (Pflüger), 1911, 138, 457-486.

VISION—GENERAL PHENOMENA

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In his experiments upon the retinas of frogs, Bauer (1) found strong evidence that an assimilating as well as a dissimilating process takes place in the visual purple in daylight vision and that the assimilating process increases with increasing intensity of light up to a certain maximum intensity. Upon first submitting the purple to strong light, it pales, but gradually adaptation takes place and the assimilating process overtakes and often exceeds the dissimilating process. In the latter case the purple returns to the original dark color. Absence of change in the color of the purple does not mean that there is no retinal process in progress, but that the assimilating process is equal to the dissimilating. These facts seem to support the theory of Hering as against that of v. Kries. The visual purple of the rods not only functions in daylight vision but it is only then that it reaches its full activity. Sivén (17) thinks the following facts point to the possible functioning of the rods for blue-violet perception: first, the spectrum at low intensities is not colorless but bluish; second, the Purkinje phenomenon takes place in the region of the rods; third, violet blindness during santonin poisoning,—since santonin affects the rods; fourth, the yellow perception during jaundice caused by affection of the rods; fifth, blue-blindness during hemeralopia; sixth, the results of the experiments of Hess on the color vision of night and day animals. The experiments which Brückner made upon the blind spot,¹ in which he found a contrast effect of the surrounding field upon the blind spot, leads him to conclude (3) that the physiological processes underlying the phenomenon of contrast take place not in the retina, but in the corpus geniculatum externum or in the visual cortex. In a preliminary report of experiments upon after images, Ferree and Rand (9) state that the results so far obtained indicate that the influence of brightness upon color excitation takes place posterior to the level usually ascribed to the paired processes.

The experiment of S. P. Thompson,² in which a sensation of light is caused by subjecting the head to the influence of a magnetic field,

¹ Brückner, A. "Ueber die Sichtbarkeit des blinden Fleckes." *Arch. f. d. ges. Physiol. (Pflüger)*, 1911, 136, 610-658.

² Thompson, S. P. "A Physiological Effect of an Alternating Magnetic Field." *Proc. Roy. Soc.*, 1910, 82, 396-398.

was repeated by Dunlap (8) in order to determine if the phenomenon was not "due to idio-retinal light under the suggestion of the hum of the coil due to the alternating current." The transformer was placed on a table near the coil "so that the loud noise of the former completely drowned the hum of the latter" and the sensation still persisted. Dunlap therefore concludes that "the phenomenon was really a matter of visual sensation." Of special interest is the fact that the sensation is strongest when the head is so turned in the magnetic field that the general direction of the optic pathway is parallel to the lines of force. Dunlap thinks rather that the alternating current alternately intensifies and inhibits a process already in progress, such as idio-retinal light, rather than that it arouses a visual sensation, but he hesitates to decide definitely from the present data. Swinton (19) some fifteen years ago observed this phenomenon of visual sensation due to the effect of the electric current. His method was to employ a continuous-current magneto generator, one terminal of which was held in one hand, while a wire from the other together with a wet sponge was held by the other hand to the side of the head. The frequency of the flicker increased with the speed of the generator. Swinton adds that this method also precludes the possibility of suggestion being the cause of the flicker.

One of the reasons given by Edridge-Green¹ in explanation of the fact that Lord Rayleigh's threshold for change in the hue of yellow (*D*) light was so much lower than the threshold he obtained by his method, namely, because of the admixture of white light in Rayleigh's experiment, has been proven false by a series of experiments conducted by Watson (21). By means of the Abney double spectrum apparatus, two fields of light of the same wave-length were projected side by side on a magnesium carbonate screen and one field changed in wave-length until the difference in hue was quite distinct. A difference of $1.4 \mu\mu$ was detected, while Edridge-Green's monochromatic patch measured $4.5 \mu\mu$. Watson then found that additions of small amounts of white light made no change in the threshold. The difference in the results of Edridge-Green and Rayleigh seems to be caused by a difference in the method of presenting the change, namely, whether two monochromatic patches are used or a single patch in which the hue changes gradually from one side to the other.

A comparison of the effect of the exposure of the eye for ten seconds to a continuous stimulation of light with that of a like exposure to an

¹ Edridge-Green, F. W. "The Discrimination of Colour." *Proc. Roy. Soc.*, 1911, B. 84, 116-118.

intermittent stimulation, upon the subsequent process of adaptation, was made by Schneider (16). The rate of alternation of light and darkness was varied as well as the relative amount of light to darkness in a given period. The intensity of the continuous light was so chosen that the brightness produced was equal, according to the Talbot law, to the brightness of the compared intermittent light. It was found that the two adaptation curves approached one another under the following conditions: first, by increasing the rapidity of alternation of the intermittent light; second, by increasing the difference between the exposure time for light and for darkness; third, by increasing the mean intensity of the intermittent light. These results were considered the more significant in that the above conditions are the same as those found by Marbe¹ to be most conducive to an elimination of flicker.

Behr (2), in his article upon the relation of dark adaptation to certain pathological conditions, includes the interesting fact that if one eye is exposed to light while the other is being dark adapted, the latter after three quarters of an hour is only half as sensitive to light as it would have been if both eyes had been dark adapted. He concludes from this that the action of the rods and the visual purple are in direct relation to a higher process. Dufour (4) has made some observations upon the after-images of motion of the Plateau spiral as well as upon those of the motion of translation. He found that if the motion was observed monocularly a negative after-image could be obtained from the eye which had been closed.

A preliminary study has been made by v. Liebermann (11) of the rate of rotation necessary for the fusion of different pairs of colors. No definite results were obtained, but the methods used and the precautions observed, as well as some of the difficulties of the problem discovered, are of interest. Dufour and Verain (7) explain a simple method of obtaining the threshold for the perception of flicker, namely, by placing a disk of n white and black sectors upon a larger disk of $n + 1$ white and black sectors. Dufour (6) has observed the same laws of fusion, flicker, etc., to hold in movements of translation of bands as in rotatory movement of disks. He also describes (5) a simple device for obtaining these movements of translation.

A method of obtaining the time that it takes for a sensation of light to reach its maximum brightness has been devised by Stigler (18). The instrument, which he calls a chronophotometer, permits

¹ Marbe, K. "Tatsachen und Theorien des Talbot'schen Gesetzes." *Arch. f. d. ges. Physiol.* (Pflüger), 1903, 97, 335-393.

the successive exposure of two neighboring fields of the same or different intensities of light and the regulation and measurement of the exposure time as well as the interval between the two exposures. If the first sensation does not reach its maximum intensity at the time of exposure of the second stimulus, it will never reach it in that part of the field adjacent to the second field, owing to the contrasting effect of the latter. By regulating the exposure times and the intervals between the two stimulations and comparing the intensity of all parts of the two fields, the approximate time necessary for the first sensation to reach its maximum intensity may be ascertained.

The phenomenon of brightness contrast has been used by Révész (15) as a basis for a new method of measuring the brightness of colors of different hues. The maximum saturation of a color can be obtained by gradually increasing the brightness of a contrast-producing field until the white (W-Valenz) of the color is entirely compensated. It follows that if two colors, for example red and green, both reach their maximum of saturation with the same increase of brightness of the contrasting field, they may be considered to contain the same amount of white. The relative amount of white, which different colors were found to contain by this method, coincides with the relative brightness of the colors as determined both by the direct method of measuring brightness at the fovea, and by the method of indirect vision. The author finds theoretical support for his method in G. E. Müller's theory of vision.

One of the most suggestive books of the year is that by Katz (10). He has given us the result of five years investigations of the various characteristics of colors and especially of those changes in these characteristics brought about by experience. He has displayed much ingenuity in the methods of his countless experiments and in the variation of the conditions, as well as a keen power of analysis and an appreciation of the relation of his results to the more general problems of vision. It is only possible here to mention some of the most important facts. As regards the localization in space, idio-retinal light is characterized by an indefiniteness of localization. The more vivid (*eindringlich*) an after-image is, the nearer it appears. What is meant by vividness of colors may be understood if one fixates the middle of a larger white surface; it will then be observed that the color gradually lessens in vividness towards the periphery. Idio-retinal light shows the lowest degree of vividness. The darker colors seem nearer than the lighter.

There are three forms in which colors may appear: first, as sur-

face colors (*Oberflächenfarben*), that is, the surface of an object seems to have a certain color; second, as surfaces (*Flächenfarben*), that is, the colors are perceived in two dimensions and without any reference to an object; third, as transparent colors in three dimensions. The last two may be reduced to surface colors by observing them through the small aperture of a screen. It is in perceiving colors as surface colors that the results of experience play a rôle. It is then that we abstract as far as possible from the existing conditions of illumination and see the color as it would appear under normal conditions. The conditions may be considered normal when the objects are seen most sharply defined and outlined. These conditions may be obtained in the open air and under a slightly clouded sky.

If we look at a gray disk placed some distance behind a revolving black episkotister through a small hole in a screen in front of the instrument, and notice that the episkotister is cutting off some of the light, we abstract from its effect, and see the gray in its normal color, that is, brighter than it appears when the conditions behind the screen are concealed from us. Vividness, however, is not affected by psychological factors, for vividness depends upon the absolute amount of light falling on the retina. Neither do psychological factors influence the difference threshold for brightness nor the absolute threshold for the normal adapted eye. But the Talbot law does not hold for brightness under the above conditions, the variations from the law becoming greater the more vivid the psychological factors become. As might be supposed from the above, the Talbot law does hold for the vividness of colors.

If it is seen that a paper is darkened by a shadow, it appears lighter than when this fact is concealed from the observer. The relative brightening of the paper by psychological factors is greater the deeper the shadow. Individual differences are greater when the psychological factors are most influential. Katz does not call these phenomena illusions, since attending to them does not entirely eliminate them. The longer one observes, the stronger is the effect of the psychological factors, but even in a very short exposure they are influential. Hering's memory-color (*Gedächtnisfarben*) theory only applies to objects with which we are very familiar. Hering explains phenomena similar to the above through adaptation and other physiological causes. Such physiological explanations are considered by Katz secondary to a psychological explanation. Also the fact that colored papers illuminated by colored light are seen in

their original colors is explained by Katz through psychological factors as against Hering's physiological explanation. On the other hand, Katz's results agree with Hering's, that contrast depends upon the intensity and quality of the retinal processes and not upon psychological factors. From the experiments on dark adaptation, Katz comes to the conclusion that the psychological factors only alter those sensations depending upon processes in the cones. Many interesting references are also made to the influence of psychological factors similar to the above in the effect of works of art.

Tucker (20) has made a series of tests on the color vision of sixty-three girls and sixty-four boys of the English schools, in order to compare their color sense with that of primitive peoples. In the color discrimination test with Holmgren's wools, in the case of all the children "blue and violet tend to be confused. Then the images with green extend their range and finally those of pink, red and yellow." In the color nomenclature test, similar mistakes were made. The names included a wide range of hues. These results coincide with those obtained with primitive peoples. Tests for the threshold for red, yellow, and blue were also made and it was found that the threshold for colors rose as the age decreased, but that the ratio of the threshold of one color to the other remained unchanged both in the tests on children and those on adults. Since these quantitative results show that the relative threshold for blue did not change, and the qualitative results, that the children made the same mistakes in color discrimination as primitive races, the author thinks that the latter's confusion of colors can hardly be explained satisfactorily through a weakness for blue due to a greater yellow pigmentation of the macula lutea among dark-skinned races. Her conclusions are rather that there are two causes for the peculiarity in color confusion among primitive people; the one, psychological, "depending on the stage of the development of the powers of observation and thought leading to mistakes similar to those made by European people," the other physiological, depending on the stage of the development of the sense organ.

Loeb (14) in his experiments upon the memory for colors used the Asher color mixture apparatus and allowed from five minutes to several days to intervene between the exposure of the color and the reproduction. Loeb concludes from the fact that the m.v. for the eleven trials made in the reproduction test for each color was less for blue and yellow than for red and green, that the precision of reproduction, and with it the actual memory for colors for the

former pair, is greater than for the latter, although the colors reproduced were further from the original in the case of blue and yellow than in that of red and green. This latter result he considers to be caused by the conditions of his method and not to be contradictory to the results of L. v. Kries and E. Schottelius¹ whose order of accuracy of reproduction was the same as his order of precision. He is, however, hardly justified in deducing an accuracy of memory from a small m.v.

Luckiesh (12) has measured the difference in visual acuity in monochromatic light and in light having an extended spectrum. To quote from the author's summary in this journal:²

"The green line of the mercury vapor spectrum was isolated and used as a monochromatic source. This line was matched in hue by light having an extended spectrum obtained by filters used with the tungsten lamp. These two green colors could easily be matched for brightness without any of the difficulties which would obtain if they differed in hue.

"A printed page of type of such size that at a distance of 1 meter it was just readable in monochromatic light, was arranged in a photometer so that two adjacent patches were illuminated respectively by the two green lights of different spectral character. For the same ease in reading it was found that the illumination having an extended spectrum must be increased 75 per cent. over the monochromatic illumination. This result was substantiated by other experiments. Later the Ives³ acuity test object was used and by this more sensitive method it was found that for two observers the illumination having an extended spectrum must be five times greater than that of the monochromatic illumination for the same visual acuity. Another observer required an increase of only 33 per cent. It was shown that there was no movement of the pupil when alternately subjected to the two lights."

Luckiesh (13) has also investigated the relation between visual acuity and wave-length. The influence of brightness differences was as far as possible eliminated. He found that "the extremes of the visible spectrum show a lower defining power than the middle region, the maximum acuity appearing to be in the yellow region."

Two essays, one by Woodworth (22), and the other by Yerkes (23), embodying the facts of the sensation of light most important for illuminating engineering, have appeared.

REFERENCES

1. BAUER, V. Ueber das Verhalten des Sehpurpurs beim Tagesssehen. *Arch. f. d. ges. Physiol.* (Pflüger), 1911, 141, 479-496.

- ¹ v. Kries, L., und Schottelius, E. "Beiträge zur Lehre vom Farbedächtnis." *Zsch. f. Sinnesphysiol.*, 1907-8, 42, 192-209.

- ² Luckiesh, L. "Monochromatic Light and Visual Acuity." *PSYCHOLOGICAL BULLETIN*, 1911, 8, 404.

- ³ Ives, H. E. "A Visual Acuity Test Object. Description of a Composite Object Composed of Superposed Gratings." *Elec. World*, 1910, 55, 939-940.

2. BEHR, C. Der Reflexcharacter der Adaptationsvorgänge insbesondere der Dunkeladaptation, und deren Beziehungen zur typischen Diagnose und zur Hemeralopie. *Arch. f. Ophthalmol.*, 1910, 75, 201-283.
3. BRÜCKNER, A. Zur Lokalisation einiger Vorgänge in der Sehsinns Substanz. *Arch. f. d. ges. Physiol.* (Pflüger), 1911, 142, 241-254.
4. DUFOUR, M. Sur la spirale de J. Plateau. *C. r. soc. de biol.*, 1911, 70, 151-152.
5. DUFOUR, M. Un appareil permettant de faire certaines expériences d'optique physiologique. *C. r. soc. de biol.*, 1911, 70, 295-297.
6. DUFOUR, M. Sur quelques phénomènes d'optique physiologique. II., III. *C. r. soc. de biol.*, 1911, 70, 485-487; 886-888.
7. DUFOUR, M., and VERAÏN, L. Sur quelques phénomènes d'optique physiologique. IV. *C. r. soc. de biol.*, 1911, 71, 289-290.
8. DUNLAP, K. Visual Sensations from the Alternating Magnetic Field. *Science*, 1911, 33, 68-71.
9. FERREE, C. E., and RAND, M. G. An Experimental Study of the Fusion of Colored and Colorless Light Sensation: The Locus of the Action. *J. of Phil., Psychol., etc.*, 1911, 8, 294-297.
10. KATZ, D. Die Erscheinungsweisen der Farben und ihre Beeinflussung durch die individuelle Erfahrung. *Zsch. f. Psychol.*, Ergbd. 7, 1911. Pp. xviii + 425.
11. v. LIEBERMANN, P. Verschmelzungsfrequenzen von Farbenpaaren. *Zsch. f. Sinnesphysiol.*, 1910-11, 45, 117-128.
12. LUCKIESH, M. Monochromatic Light and Visual Acuity. *Elec. World*, 1911, 58, 450-452.
13. LUCKIESH, M. The Dependence of Visual Acuity on the Wave-Length of Light. *Elec. World*, 1911, 58, 1252-1254.
14. LOEB, S. Ein Beitrag zur Lehre vom Farbengedächtnis. *Zsch. f. Sinnesphysiol.*, 1911, 46, 83-128.
15. RÉVÉSZ, G. Ueber eine neue Methode der heterochromen Photometrie. *Ber. IV. Kongress f. exper. Psychol.*, 1911, 217-219.
16. SCHNEIDER, S. Die Helligkeitsadaptation bei kontinuierlichen und diskontinuierlichen Erregungen. *Psychol. Stud.*, 1911, 7, 196-228.
17. SIVÉN, V. O. Die Stäbschen als Farbenperzipierende Organe. *Klin. Monatsbl. f. Augenheilkunde*, 1911, 49, 531.
18. STIGLER, R. Chronophotische Untersuchungen über den Umgebungscontrast. *Ber. IV. Kongress f. exper. Psychol.*, 1911, 279-281.
19. SWINTON, A. A. C. Visual Sensations from the Alternating Magnetic Field. *Nature*, 1911, 86, 143.
20. TUCKER, A. W. Observations on the Colour Vision of School Children. *Brit. J. of Psychol.*, 1911, 4, 33-43.
21. WATSON, W. Note on the Sensibility of the Eye to Variations of Wave-Length. *Proc. Roy. Soc.*, 1911, 84, 118-120.
22. WOODWORTH, R. S. The Psychology of Light. *Trans. of the Illuminating Engineering Soc.*, 1911, 6, 437-471.
23. YERKES, R. M. *The Psychological Aspects of Illuminating Engineering.* (Lectures on Illuminating Engineering, Vol. 11.) Baltimore: Johns Hopkins Press, 1911. Pp. 575-604.

VISION—PERIPHERAL, FOVEAL, ETC.

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The year's work in this field is comprised in four articles.

A. Pick (4) gives a clinical report on cases of functional narrowing of the visual field. He concludes, in contradiction to the commonly accepted view, that in these cases the patient is just as much aware of his defect as is the patient who suffers the contraction from organic causes. Two circumstances he thinks have led to the false conclusion by previous writers. (1) The patient has not been carefully questioned with regard to what he sees. (2) The examiner has been influenced by certain objective signs which have not been studied with sufficient care. For example, it has been claimed that no disturbance of orientation is suffered. The patient must, therefore, not be aware of the defect in his visual field. But Pick and many others have found that disturbances in orientation do occur. They last, however, only a short time after the contraction has begun. The patient soon adapts to his changed condition of seeing and recovers his power of orientation. This is what happens in every case of sudden loss of visual acuity. It also happens when the field is narrowed from organic causes. Such evidence therefore, argues Pick, should not lead to the conclusion that the patient suffering from functional contraction is less aware of his defect than the patient with organic disease.

Pick supports his position by the direct testimony of his patients. He wishes, moreover, to emphasize the importance of carefully questioning the patient in making diagnoses. The testimony of the patient is necessary to diagnosis and it can not be assumed that he can and will tell of his own accord all the diagnostician needs to know.

Edridge-Green (2) describes some visual phenomena connected with the yellow spot. The article consists of a statement of the observations of previous writers on the following points supplemented by some observations of his own: various appearances in the field of vision due to peculiarities of the yellow spot; entoptic appearance of the yellow spot and the blood vessels of the retina; currents seen in the field of vision not due to circulation; and appearances due to the pigment cells of the retina. The third of these topics alone contains sufficient new material to warrant mention in this review. This topic is of particular importance to Edridge-Green

because of its bearing on his theory of vision. He assumes that all visual sensations are caused by the decomposition of the visual purple. This decomposition sets up electrical impulses which travel along the optic nerve to the brain. These impulses he believes are wave-like and periodic in nature. Each wave-length of light sets up an impulse different from that set up by every other wave-length. A physiological basis is thus laid for the different visual qualities. The visual purple is generated in the rods, hence there is none in the fovea. But it is necessary to foveal vision hence it must be supplied from the extra-foveal retina. It is the streaming of the visual purple from the peripheral retina to the fovea that constitutes, he thinks, the currents seen in the field of vision not due to circulation. He is able to see these currents under the following conditions: with one eye partially covered; with one or both eyes open at full illumination; with the eyes open in the dark-room; with a field of vision given by looking through a yellow-green glass; and with an intermittent stimulation by light produced by rotating a disk composed of white and black sectors. There are four main stream channels which are fixed in position. These four channels end in the fovea and form a figure closely resembling the written letter X. On examining the retina of a monkey he finds four shallow channels leading to the fovea which correspond roughly to the stream channels seen by him entoptically. Between the fixed stream channels indefinite streaming movements are observed.

The streaming has a characteristic effect on visual sensation. The stream currents carry the visual quality, color and brightness, of the region from which they come into the after-image. They also tend to move the after-image towards the center of the field of vision.¹

¹ Edridge-Green seems inclined to identify this phenomenon with the streaming phenomenon described by the writer in 1908. The writer is strongly impelled to question the propriety of this identification because of the obvious disagreement of the phenomena in so many important particulars. (1) Even a casual comparison of the drawings representing the two phenomena shows many differences that are characteristic and essential. In fact not even a general similarity is found between the stream patterns and the appearance and behavior of the streaming material in the two cases. (2) The descriptions of the phenomenon given in the two cases are even more incompatible. If there is one thing above another that is characteristic of the "streaming phenomenon" as it was observed and described by the writer, it is just the absence of any fixed channel or path of movement. There is a general tendency for the streams to move towards the center of the field of vision but that movement may occur along any possible meridian in the field of vision. Very frequently also the stream is deflected from its course before it reaches the center of the field of vision or even that

Haycraft (3) reports work on the color sensitivity of the retina immediately surrounding the blind spot. In mapping the blind spot with a colored stimulus in 1907, he noticed that when the stimulus fell just within the blind spot a slight movement caused it to be seen as gray while a greater movement caused it to be seen in its proper color. This led him to investigate the relative sensitivity of the margin of the blind spot to colored and to colorless light.¹ The investigation was conducted by means of a scotometer. The scotometer consists of a head-rest, a projection-screen, and a supporting base. The projection-screen is provided with a fixation point, a movable stimulus, and a frame fastened immediately behind the movable stimulus to hold the paper on which the outline of the blind spot is to be traced. The movable stimulus is fastened on the front end of a plunger which, when pushed in, punches a hole in the paper in the frame behind. A line connecting these holes marks the outline of the blind spot. The stimulus is moved by means of two screws one of which gives it a motion in the vertical plane and the other in the horizontal plane. By means of this adjustment the position of the stimulus can be changed by small and definite amounts, a feature of particular advantage in the technique of the problem. Red, green, blue, yellow, and gray stimuli

part of the field corresponding to the "external fovea." This deflection is often traceable to an involuntary eye-movement and can generally be caused by a sharp voluntary movement executed at the right time. Space will not be taken here to enumerate other numerous and important points of difference. The points of similarity can be pointed out more briefly. Both are subjective movement phenomena not caused by the circulation of the blood, and the tendency of movement in both cases is towards the center of the field of vision. (3) Characteristic differences are also found in the effect on visual sensation. Edridge-Green says the currents described by him carry the visual quality, color and brightness, of the region from which they come into the after-image. They also tend to move the after-image towards the center of the field of vision. No further details are given. If one be permitted to infer details, it is obvious that the effect of streaming on the fluctuation of after-images described by the writer could not be compatible with a streaming system in which the distinctive and definite streaming is limited to four narrow channels. The writer is forced to conclude, then, that either Edridge-Green and he have not observed the same phenomenon, or that they have differed widely in their descriptions of its essential features.

¹ That there is a color-blind area around the blind spot has been mentioned by Johansson (*Uppsala Läkareförenings Förhandlingar*, 1884, 19, 491-493), Ovio (*Annali di Ottalmologia*, 2, 1906, 36), and Polimanti (*Jour. de Psychol.*, 1908, 5, 298). That the order of loss of sensitivity in passing from the surrounding retina into the blind spot is the same as it is in passing from the center towards the periphery of the retina was mentioned by the present writer in a paper read before the meeting of experimental psychologists held at Princeton in April, 1909.

were used in mapping the blind spot. The brightness of the colors was in each case made equal to the brightness of the yellow by the method described by Abney (*Philos. Trans. of Royal Soc.*, 1886 and 1892). Several observers were used and some variation was found in the order of loss of sensitivity for the different observers. In Haycraft's own case, as the blind spot was approached from any direction, sensitivity was lost in the following order: red, green and yellow, blue, and gray. Using the same stimuli to map the sensitivity of the retina as a whole, he found the same order of loss of sensitivity as the stimuli were moved from the center towards the periphery of the retina.

A. Brückner (1) publishes concerning "Die Sichtbarkeit des blinden Fleckes." Both the experimentation as it is described in the article and the conclusions seem to the writer to be in some measure open to question. Extended criticism, however, will not be attempted in this brief review.

Three explanations have been given for the absence of a gap in the monocular field of regard: Weber's theory of shrinkage, DuBois-Reymond's and Volkmann's theories of associative filling-in, and Tschermak's theory of physiological induction. Brückner decides against the theories of shrinkage and associative filling-in, and accepts the theory of physiological induction. The gap is filled in either by irradiation or by simultaneous contrast. It is filled in most frequently by irradiation. This is why in ordinary monocular vision we are not conscious of the blind spot.

Brückner is not the first to claim that visual sensations may be referred to that part of the field of vision usually called the blind spot. Prior mention has been made by Purkinje, Heinrich Müller, Meissner, Aubert, Charpentier, Woinow, Helmholtz, Finkelstein, Zehender, Tschermak, Czermak and others. Brückner aims merely to verify the observations of his predecessors and to extend the conditions under which the phenomenon may be observed. (1) With the eye thoroughly dark-adapted the blind spot may be seen as a dark disk surrounded by a light halo, immediately following a quick pressure of the front of the eye-ball through the closed lids. The phenomenon lasts only a fraction of a second. This observation has been previously made by Aubert and Finkelstein. (2) The blind spot may be seen by the method used by Purkinje to demonstrate the *Aderfigur*. This observation has been made by Heinrich Müller, and Tschermak. (3) When one looks with one eye at a uniform field, for example, the sky at twilight, one

sees the blind spot as a dark disk surrounded by a light halo. Observations of this kind have been made by Helmholtz, Woinow, Zehender, Charpentier, and Tschermak. Brückner extends the observation to fields of white, of black, and of color. On white paper he sees the blind spot as a shadowy spot surrounded by a light halo; on black paper as a spot of more intensive blackness surrounded by a light halo; on a field formed by looking at a neutral surface through colored glass as a dark spot surrounded by a halo of the color complementary to the field. (4) When the field is formed of black and white paper with their line of junction passing vertically through the blind spot, the part of the field towards the center of the retina is seen as bulged out to fill the area of the blind spot. Thus when the white field is towards the center of the retina, the blind spot is filled in with white; and, commonly, when the black field is towards the center of the retina, the blind spot is filled in with black. In each case the bulging portion is surrounded by a halo of antagonistic quality. The bulging is due to irradiation from the stronger field and the halo is due to marginal contrast. In using colored fields he finds that the law of irradiation from the stronger field does not always hold. The weaker field, *i. e.*, the field beyond the blind spot, sometimes fills in the gap. (5) An after-image may be gotten of the visual quality filling in the blind spot. When one with a thoroughly dark-adapted eye looks for a moment at the sky at twilight and then closes the eye, he sees at first a black disk with a halo in a light field which soon gives way to a light disk with a black halo in a dark field. This observation has been made by Charpentier and Tschermak. (6) At the make and break of an electric current, sent through the head by means of two electrodes, one applied to the middle of the forehead and the other to the back of the neck, the blind spot is seen sometimes as a light and sometimes as a dark disk. This phenomenon has been reported by Tschermak and others.

In general Brückner is inclined to attribute the visibility of the blind spot with the dark-adapted eye to contrast, and with the light-adapted eye to irradiation. He gets into difficulty, however, in attempting to apply this principle of explanation in detail. (1) When the field is white and the blind spot is seen as a dark disk surrounded by a light halo on a white ground, he explains the quality of the disk as due to contrast from the surrounding field. For the halo he gives the rather remarkable explanation that it is due to marginal contrast between the two fields, one of which he has already explained as a contrast effect due to the other. When the field is black and the

blind spot is seen as a disk of more intensive blackness, he offers no explanation, yet as before the observation was made with a dark-adapted eye. When the field is colored the blind spot is almost invariably seen as a dark disk instead of in the color complementary to the field. The halo in this case is of a color complementary to the field. He attempts to explain the failure of the blind spot to appear in the complementary color as due to the extreme susceptibility of the blind spot to fatigue. The contrast color is of such short duration it can not be observed. This explanation, however, can hardly be accepted as satisfactory. In the first place no reason is given why the blind spot should fatigue so easily to color and apparently not at all, within the limits of the observation, to brightness; and in the second place, according to the writer's experience, the tendency of color contrast within limits is to grow with prolonged observation rather than to disappear. (2) In case the field was half white and half black with the line of junction passing vertically through the blind spot, the observation was also made with a dark-adapted eye. Yet in this case Brückner says the blind spot is filled out by irradiation from the stronger half of the field.

REFERENCES

1. BRÜCKNER, A. Ueber die Sichtbarkeit des blinden Fleckes. *Arch. f. d. ges. Physiol.*, 1910, 136, 610-658.
2. EDRIIDGE-GREEN, F. W. Visual Phenomena Connected with the Yellow Spot. *J. of Physiol.*, 1910, 41, 263-275.
3. HAYCRAFT, J. B. The Color-blind Margin of the Blind Spot, and the Scotometer. *J. of Physiol.*, 1910, 40, 492-497.
4. PICK, A. Zur Psychologie des konzentrisch eingeengten Gesichtsfeldes. *Arch. f. d. ges. Physiol.*, 1910, 136, 101-106.

VISION—COLOR DEFECTS

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It has long been known that red-green blindness is inheritable and that it occurs more frequently among men than among women. As early as 1876 Horner (6) formulated a law of descent; that color-blindness is ordinarily transmitted to males through unaffected females. In a number of recent books on heredity the attempt has been made to explain the transmission of color-blindness by Mendel's law. Bateson (1) considers color-blindness to be a sex-limited unit character, dominant in males and recessive in females. "Color-blindness is not, therefore, as might have been imagined, a condition

due to the omission of something from the total ingredients of the body, but is plainly the consequence of the addition of some factor absent from the normal. We can scarcely avoid the surmise that this added element has the power of paralyzing the color-sense, somewhat as nicotin-poisoning may do." Bateson's views find expression in the recent books of Punnett (9) and Doncaster (4). The latter puts the matter briefly as follows: "Color-blindness is dominant in males, but recessive in females, but at the same time an affected man transmits the 'factor' for color-blindness only to his daughter so that while his sons and their descendants are free, his grandsons through his daughters may be affected" (p. 84). Castle (2) and Davenport (3) also regard color-blindness as sex-limited in descent, but consider the defect to be caused by the absence of a "factor" necessary to normal vision, a position more consistent with psychological theories of color-vision, and apply to the problem the recent cytological theory of sex-chromosomes. Castle (p. 180) says: "A color-blind man does not transmit color-blindness to his sons, but only to his daughters, the daughters, however, are themselves normal provided the mother was; yet they transmit color-blindness to half their sons. A color-blind daughter may be produced, apparently, only by the marriage of a color-blind man with a woman who transmitted color-blindness, since the daughter to be color-blind must have received the character from both parents, whereas the color-blind son receives the character only from his mother. Color-blindness is apparently due to a defect in the germ-cell—absence of something normally associated there with an *X*-structure, which is represented twice in woman, once in man."

The assertion is often made that dichromates equal or surpass persons of normal color vision in discrimination of small differences in color tone. The only experimental work upon the question, that of Brodhun, showed the *deuteranope* tested (Brodhun) to be more sensitive to difference in color tone in the more refrangible part of the spectrum than were two normal observers (König and Uthoff). This superiority was most marked in the region of the neutral band. Liebermann and Marx (8) report an experimental investigation of the question, with a *protanope* and a normal person as subjects. The Helmholtz color-mixing apparatus was used, and tests made with a longer list of lights than Brodhun tried, including among others a non-spectral purple formed by the mixture of red and blue light, which appeared colorless to the protanopic subject. The results showed the protanope clearly inferior to the normal subject in distinguishing differences in color quality, throughout the whole series

of colored lights, thus directly contradicting Brodhun's results. The authors do not think it justifiable to assume that this difference is to be accounted for by the difference between protanopes and deuteranopes.

Köllner (7) shows how acquired color-blindness may be distinguished from congenital protanopia and deuteranopia by psychological tests, without reference to its accompanying physiological symptoms—lowered visual acuity, abnormal condition of the retina, etc. Acquired red-green blindness, like congenital red-green blindness, is a two-color system with a neutral zone in the green-blue region. In the acquired form, however, we find no division into distinct groups like protanopia and deuteranopia without transition forms, but, rather, a fairly definite condition of dichromatic vision which appears regularly at a certain stage in progressive tabetic atrophy of the optic nerve and in chronic alcohol poisoning. It is, further, a quantitative reduction from the normal condition, with color-memories intact, rather than a qualitative simplification of normal color-vision with dichromatic color-memories. By means of Nagel's color-mixing apparatus and anomaloscope, Köllner finds that in acquired red-green blindness the subjects see colors at a very low saturation (as they would appear to a normal person through a thin white veil). As a result of this, it is especially difficult to determine exactly the limits of the neutral zone, faint colors from the warm end of the spectrum which would appear yellowish to the congenital color-blinds being seen as white by the acquired color-blinds. Moreover, the stage of the progressive defect can be determined by finding which colors are equivalent to white, since they fade out in the following order: green, yellow, red, blue. Ordinarily red appears of about the same brightness to the acquired color-blind as to a deuteranope, about the same amount of yellow being needed in both cases to make the red-yellow equation. In two out of about 100 cases, the subjects showed the protanopic lowered sensitiveness to the red end of the spectrum, but in both cases there is considerable reason for assuming that congenital protanopia existed before the acquired defect developed.

Hayes (5) examines the evidence for the common assumption that all typical cases of partial color-blindness are dichromates—see only yellow and blue—and presents the results of a series of experiments upon 19 new cases, one of whom is a woman color-blind in one eye only. He feels that theoretical bias has prejudiced the interpretation of the facts in many of the published articles on color-blindness; and upon the basis of his own historical and experimental work he concludes that dichromacy is not a typical but an extreme condition of partial color-blindness connected with normal vision by

a series of intermediate forms showing greater or less deficiency in red and green, but not totally lacking red and green sensations. Five lines of evidence are considered. (1) Opposed to the testimony of various color-blinds (Dalton, Pole, etc.) that they see only blue and yellow, Hayes presents the testimony of five of his subjects that red and green are specifically different color qualities from yellow and gray. This claim is further supported by a study of the color-confusions made by these observers. (2) Dichromates should accept mixtures of blue, yellow, black and white as matches for all colors. But when Hayes presented reds and greens to his observers under favorable conditions—high saturation, large area, bright illumination—no equations could be made, oftentimes, without the addition of red or green to the dichromate mixture. (3) Hayes presents no new data upon acquired color-blindness, and thinks it unsafe at present to claim analogies between the acquired and congenital forms. The findings of other investigators, however, raise a significant question, whose ultimate solution promises support to the thesis of his paper. If sensitivity to green may lapse before sensitivity to red is lost, and if transitional forms between trichromacy and dichromacy occur in acquired color-blindness, what theoretical warrant can there be for refusing to believe that an analogous series of transitional forms occurs in congenital color-blindness? (4) To meet the claim that colors appear to the partially color-blind as they do to normal persons stimulated in the blue-yellow zone of the eye, Hayes quotes Baird's conclusion that retinal function in the periphery lapses, when it does lapse, in a gradual and not in an abrupt fashion, a conclusion which supports his own conclusion. (5) A review of the experiments performed upon the 7 historical cases of monocular red-green blindness shows little evidence of strict dichromacy except in the case reported by von Hippel, while the new case extensively studied by Hayes gives undoubted evidence of the appreciation of green as a distinct color quality. In general, then, as there seems to be so large a mass of evidence, direct and indirect, for the presence of sensations of red or green in the color-systems of the partially color-blind, Hayes thinks we should regard dichromacy as an extreme form of partial color-blindness, and class as partially color-blind, also, all mild cases of color deficiency in which an equation can be formed between an unsaturated blue-green or green and an unsaturated blue-red or red.

REFERENCES

1. BATESON, W. *Mendel's Principles of Heredity*. New York: G. P. Putnam's Sons, 1909. Pp. 396.

2. CASTLE, W. E. *Heredity: Its Relation to Evolution and Animal Breeding*. New York: D. Appleton, 1911. Pp. 184.
3. DAVENPORT, C. B. *Heredity in Relation to Eugenics*. New York: Henry Holt and Co., 1911. Pp. 298.
4. DONCASTER, L. *Heredity in the Light of Recent Research*. New York: G. P. Putnam's Sons, 1910. Pp. 140.
5. HAYES, S. P. The Color Sensations of the Partially Color-Blind, a Criticism of Current Teaching. *Amer. J. Psychol.*, 1911, 22, 369-407.
6. HORNER. Die Erbllichkeit des Daltonismus. *Ophth. Klinik.*, 1876.
7. KÖLLNER, H. Beiträge zur Pathologie des Farbensinnes. Ueber die Unterscheidung der erworbenen Rotgrünblindheit von der angeborenen Protanopie und Deutanopie. *Zsch. f. Augenhk.*, 1910, 23, 97-111.
8. LIEBERMANN, P. v., und MARX, E. Ueber die Empfindlichkeit des normalen und des protanopischen Sehorgans für Unterscheide des Farbentons. *Zsch. f. Sinnesphysiol.*, 1911, 45, 103-108.
9. PUNNETT, R. C. *Mendelism*. New York: Macmillan Co., 1911. Pp. 192.

HEARING

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The year 1911 has brought us no very exhaustive or systematic research in the field of hearing. Pear (7) has published some results obtained in the Würzburg laboratory which tend to substantiate experimentally the difference in degree of fusion which is usually admitted to exist between major and minor chords. He worked with both musical and unmusical observers, testing their respective abilities along this line (8) by means of the analysis of intervals, the differential limen for pitch and a "singing" test in which they were required to imitate notes given at random. He also made a "consistency" test on the basis of eleven musical intervals, varying from the octave to the minor second, by comparing each of these intervals with every other one four times.

The principal experiments were made with the Appunn tonometer. The method was that of "paired comparisons," the observer being required to judge by direct impression which of two tri-tonal chords possessed the greater degree of fusion. The extreme notes in the chords compared remained constant, and included the intervals 3 : 5, 2 : 3, 1 : 2, 2 : 5, 1 : 3, and 1 : 4. The middle tone was shifted so as to produce in each experimental comparison two chords of three constant intervals, the smaller of which was placed, now between the lower and the middle tone, now between the middle and the higher tone.

His results substantiate the assumption that "the degree of fusion of a chord varies with the position of its constituent degrees of fusion within the tonal scale, decreasing when the worse degrees are the

lower, and increasing when they are the higher." The degree of fusion "increases when the interval possessing the greater *frequency-ratio* (*i. e.*, the 'greater interval' in the musical sense) occupies the lower, and decreases when it occupies the higher position." The same is true for intervals of "greater *frequency-difference* (*i. e.*, the 'greater interval' in the physical sense)." These conclusions are in accord with the assumption that chords possessing greater *indirect* clang relationship are more highly fused than those possessing greater *direct* relationship. Meyer's tentative assumption that "the fusion of a chord of three clangs is the higher, the simpler the ratios of its frequencies, whether the chord be considered as a whole or the tones be taken in pairs" is also substantiated. Finally, the experiments seem to show that these conclusions have a more general significance than the mere differentiation of major and minor chords in music, since they apply to "unmusical" as well as to "musical" chords.

Stumpf (12) takes up some of the criticisms which have been urged against his explanation of consonance. After defining fusion as a *uniformity* rather than a *unity* of effect, and contrasting it with similarity, which increases with the decrease in an interval, he proceeds to warn against the correlation of fusion with physical pitch, since the pitch of a tone is known to vary with its distance from the ear. He concludes that the degree of fusion is a function of two physiological pitches, and that it is impossible for the same pair of tones, thus considered, to fuse in different degrees. Consonance and dissonance exist only between two simultaneous tones; successive tones reveal the phenomena of relationship. As long as we deal with sense impressions, consonance and dissonance exist, not in specific degrees, but in gradual differentiations. In dealing with music, however, we have passed beyond simple sense impression. Our music is based upon a tri-tonal chord, either major or minor. This chord is determined rationally by the greatest number of tones within an octave, all of which are mutually consonant in such a manner that in passing from the lower to the higher tones in succession, we pass from the stronger to the weaker degrees of consonance.

Stumpf regards the major and minor as fundamentally equal. The musical scale is built up by the derivation of successive tri-tonal chords of the sort mentioned, the so-called "dissonant" tones which thus come in are all indirectly related to the fundamental. In this system *concord*s consist in any three principal tones, either major or minor, but they must contain a fifth or fourth, and a third or sixth. All remaining chords are *discordant*. Concordance and discordance are thus very much more complex than are consonance and dis-

sonance, although they are based upon these. Accordingly, the same consonant pair may be judged as concordant or discordant by virtue of the chord to which it is conceived to belong. The consonance of the pair is in no wise affected, but its concordance is. Musical thought, based upon this system of major and minor chords, is responsible, in the varying attitudes which are aroused in us, for the acceptance or rejection of single intervals. This accounts for the seeming contradiction which has been noted to exist at times between consonant pairs and musical practice.

In a critical article directed against Krüger's reply to Stumpf's original strictures upon the derivation of consonance from the effects of difference tones in the total complex, the Berlin psychologist returns (13) to his contention that the interval 800 : 1,100 ought, on Krüger's hypothesis, to be completely consonant, because no beats or mean-tones are present among the difference tones aroused. Krüger having since responded that the large number of difference tones in this and similar cases affords a complex clang which is disadvantageous to consonance, Stumpf answers that it is absurd to suppose that the mere aggregation of tones should have any such result, since no such effect is apparent in the addition of successive tones in the octave relation.

With regard to certain other "critical intervals" which Stumpf had pointed out, Krüger has contended that the "sonance" character of intervals extends only to the approximate limits of the human voice, 80-1,024 vib., beyond this, the intervals all tend to become *neutral*. This Stumpf denies, claiming that musical practice shows that a limit cannot be set under 4,000 vib. In Stumpf's opinion, then, Krüger's theory contradicts itself, even if we assume the five difference tones, the existence of which Stumpf has experimentally tested and largely disproven.¹ One consequence of Krüger's theory would be that the intervals of the third and fourth accented octaves should be the strongest and clearest in their consonant effectiveness, because here the difference tones are strongest and clearest. Yet in this range appear the "critical intervals" which in consequence of such a theory should be completely consonant, yet they are not.

Goebel (4) has made an interesting observation which he believes to be in substantiation of the Helmholtz theory of consonance. A tone of sufficient intensity, he finds, is accompanied by a second tone whose pitch is one octave lower. When two weak tones in the octave relationship are presented simultaneously, one to each ear, there appears to be no unity in the effect.² If, however, the higher of the

¹ Cf. "Summary on Hearing," this journal, 1911, 8, 93 ff.

² An analogous phenomenon has been observed by Ebbinghaus (cf. *Grundzüge*,

two tones be intensified, the unity is at once established, since the lower tone is then present in each ear. The author assumes that different cells in the same cross-section of the cochlea must be specifically sensitive to octaves. The assumption provides that the outer cells in a given cross-section may function for the higher tone, the inner cells for the lower tone, although in man, where the number of cells is small, the differential effect may be centrally produced. With the exception of very low, and perhaps also of very high, tones the author concludes that the intensification of any single tone is effective in exciting certain cells which produce an additional tone one octave lower than the objective. This may be offered in explanation of certain cases of fusion among pure tones in the octave relationship where over-tones are not objectively present to make the Helmholtz explanation of identical over-tones applicable.

In a combined report with v. Hornbostel made before the Fourth Congress for Experimental Psychology (11), Stumpf refers to the collection of phonograms of exotic music which has been in progress since 1904 at the Berlin Institute. He also indicates two interesting points in connection with the study of non-European musical systems. First, it has been found from examination of xylophones and metallophones that the Javanese have a scale of seven equal intervals, and the Siamese a scale of five equal intervals. The equality of the relations of adjacent tones is so exact that we must assume for these people a sense for equality of interval which we apparently have lost in the harmonic development of our music. Wundt's explanation that the intervals have been determined by a mechanical process of making the instrument mathematically correct as to the relative lengths of the bars of wood or metal is not substantiated by an examination of the instruments themselves. They reveal both a crude manufacture, and also filing and weighting for the evident purpose of tuning them after completion to the exact intervals required. The second point has reference to the appearance of simultaneous octaves, fifths and fourths in primitive choral singing. Stumpf assumes that this must have resulted from a selection based upon unitary effectiveness, and thus reveals the universality of the principle of fusion. He believes it probable that, prior to such selection, primitive melodies arose from the use of arbitrary small intervals which were quite unrelated.

In his portion of the report, v. Hornbostel describes another way I., 2d ed., pp. 345-346) in substantiation of his theory of "undertones" as the explanation for tonal fusion. It may be further suggested that Goebel's observations can be quite readily adapted to the Ebbinghaus theory.

in which polyphony may have arisen. In passing from a solo to a choral part, the second party may start too soon. This would result in simultaneous tone effects some of which are perpetuated in practice because of their fundamental fusion. The usage of simultaneous major seconds, however, which he has found to be frequent, remains unexplained. The author makes a second point with regard to the very high development of rhythm in exotic music. The fact that uncivilized folk do not count the beats, as we are apt to do, probably explains their greater capacity for rhythmical groups and variations. It is interesting to study the complexity of their rhythms in combination with a melody. The rhythmic accompaniment often shows a relatively independent structure with accents which vary considerably from those of the melody.

Hermann (6) returns to the substantiation of his theory of the "formant" as the basis of vowel sounds. Experiments with the microphone method show the production of formants whose periodicity is uninfluenced by the note on which the vowel is sung. However, as soon as the vowel note exceeds noticeably the pitch of the formant, the vowel is no longer heard. The formant is therefore a fixed tone which characterizes the vowel. It is produced by a blowing process, with the mouth cavity as a resonator. This is quite different, however, from the Helmholtz notion of the resonance effect produced by this cavity in intensifying characteristic overtones. These tones would often be altogether too weak for such a purpose, as, for instance, *i* on a bass note would depend upon the 21st-29th partials. Resonators, according to Hermann, behave differently when they are blown and when they respond sympathetically. It is in the former case that vowels result from "anaperiodic" blowing of the mouth resonator in the period of the voice vibration. Whether the mouth tone is harmonic or inharmonic to the voice note is of no importance. Hermann replies briefly to Köhler's experimental attempt to disprove the formant theory, but aside from indicating that Köhler has misapprehended the nature of the relationship existing between the vowel tone and the formant, or vowel quality, he does not enter upon a critique of Köhler's interesting results.¹

In reply to certain experiments by Fredericq which seemed to show that the speed of a phonograph has no influence upon the vowel sounds produced by it, Hermann (5) adds that the vowel character is not exclusively dependent on pitch, which, is of course, altered with varying speed of the phonograph. It depends also upon other things, as the manner in which the formant vibration is spread over the

¹ Cf. *l. c.*, 97 f.

period. For each vowel, too, the formant may vary over a certain range: *a* from e^2 to a^2 , *e* from c^4 to $d^{\#4}$. Certain facts are not yet explained, as the passage of high tones into *a* sounds, and the passage of *e* into *o* and *i* into *u* when the speed of the phonograph is increased. It may be that *e* and *i*, which according to Helmholtz find their characteristic in the fourth accented octave, possess also a deeper-lying formant to which they are driven by the increased pitch, and thus they approach *o* and *u* of the lower register.

Sander (9) experimented upon the effect of duration on the intensity of tones. He used two successive stimuli furnished by tuning forks and conducted to the ear by means of telephonic connection. One of these was given with a constant full intensity, but with varying durations in the different experiments. The other, by which the subjective intensity of the first was measured, had a constant duration and an easily variable intensity. Reproduction of the same stimulus, after an interval of three seconds, was marked by an increased intensity of 4 per cent. to 5 per cent. The apparent rising intensity of a tone, for all degrees of pitch and objective intensity, is rather rapid at first and then more gradual. The point of time at which the stimulus first reaches its tonal maximum cannot be exactly determined, but with the author it lies always between 615 and 925 ϵ . The remission of intensity began for a tone of 218 vib. after 1,110 ϵ ; with the weaker tones 384 and 640, there was no remission indicated. With more intensive stimuli the tone rises more rapidly, yet it is doubtful if the maximum is reached more quickly. Increase in vibration rate plus increase in intensity effects a still quicker arousal. It is impossible to alter the quality with a constant intensity since the two factors operate together.

Urbantschitsch (14) reports a few preliminary experiments to prove that reflex movements are occasioned by sound stimuli. He had ten observers read aloud while various tones and noises were sounded. They were instructed to pay no heed to the sounds. In all cases speech was interfered with. Reflexes were called out particularly in the regions of the neck and breast. The reflexes were found to vary in different persons, but no very exact correlations were noted. The results appear to be rather slight for supporting the contention that sounds occasion definite reflex responses.

With reference to the physiology of hearing, Shambaugh (10) makes an interesting plea that more consideration be given the tectorial membrane in the functioning of the Corti organs. He points out the anatomical fact that in all three organs of the labyrinth

hair-cells are to be found in contact with a fine membrane. Whereas it is generally admitted that the stimulations of the semicircular canal and the vestibule are mediated by reciprocal effects of the hairs and the membrane above, the tectorial membrane of the cochlea is overlooked in favor of the basilar membrane. It is impossible, the author thinks, that the basilar membrane should be adequate to the function of hearing, since it is subject to a varying blood pressure which can not but affect its vibratory capacity. The reciprocal effects between the hair-cells and the tectorial membrane are not complicated by such disturbances. Although it is impossible to demonstrate the manner in which this delicate membrane might behave under stimulation, we may, perhaps, assume that different regions respond with different tones, the high tones being produced near the base, the low tones near the apex. We should thus be able to accommodate for the pathological "tone-islands," and the facts of tonal analysis.

Ewald (2) criticizes certain results supposedly in confirmation of the Helmholtz theory, obtained by Wittmaack and Yoshii. They worked (separately) on guinea-pigs, and brought about the destruction of certain regions of the Corti organ by stimulation with tones of varying pitch. Ewald shows that the regions destroyed were not definitely in accord with the theoretical location of the particular tones in question, and, furthermore, that the areas were much too large to be accommodated to the Helmholtz theory. Ewald has noticed with his "camera acustica" that small bubbles appearing on the membrane in the water are driven forward with great force by sudden intensive tones. It is in accordance with this analogy that he would explain the results of the two investigators named.

Frey (3), having demonstrated in many cases ankylosis between the malleus and incus, and furthermore, that this is in no case a true joint, concludes that there is no displacement here during the act of hearing, and that the protection of the conducting apparatus, which was supposed to be effected by the movements of these bones, may and must be explained by other factors, as the various ligaments involved.

In an interesting volume Dupré and Nathan (1) have summarized the principal results thus far obtained in the study of musical defects in various types of mental disturbance. After an introductory chapter in which the psychology of language in general, and the musical language in particular, is described in a simple, and also somewhat naive, manner, the authors proceed to the consideration of sensory, psychic and motor disturbances among aphasic,

psychopathic and insane individuals. The origin of partial amusia is, they believe, dynamic, the organic cases being invariably complex or total. They find no necessary parallelism between amusia and aphasia, and a precise cortical localization for the disturbances in musical language is not evident. In dementia musical capacity suffers along with the other mental activities, but somewhat more slowly. An interesting critical study of the psychoses of great musicians leaves little support for the contentions of Lombroso and Grasset that these individuals are peculiarly susceptible to insanity. A consideration of *melo-therapy* brings the conservative conclusion that it has no great virtue as a cure for the insane. With psycho- and neuropathic cases its influence is at times undeniable, yet even here it is entirely conditional on the individual musical capacity and interests of the subject treated.

REFERENCES

1. DUPRÉ, E., et NATHAN, M. *Le Langage Musical*. Paris: Alcan, 1911. Pp. vii + 195.
2. EWALD, J. R. Ueber die neuen Versuche, die Angriffsstellen der von Tönen ausgehenden Schallwellen im Ohre zu lokalisieren. *Arch. f. d. ges. Physiol.*, 1910, 131, 188-198.
3. FREY, H. Die physiologische Bedeutung der Hammer-Ambossverbindung. *Arch. f. d. ges. Physiol.*, 1911, 139, 548-561.
4. GOEBEL, —. Ueber die Ursache der Einklangsempfindung bei Einwirkung von Tönen, die im Oktavenverhältnis zueinander stehen. *Zsch. f. Sinnesphysiol.*, 1911, 45, 109-116.
5. HERMANN, L. Der Einfluss der Drehgeschwindigkeit auf die Vokale bei der Reproduktion derselben am Edison'schen Phonographen. *Arch. f. d. ges. Physiol.*, 1911, 139, 1-9.
6. HERMANN, L. Neue Beiträge zur Lehre von den Vokalen und ihrer Entstehung. *Arch. f. d. ges. Physiol.*, 1911, 141, 1-62.
7. PEAR, T. H. The Experimental Examination of some Differences between the Major and the Minor Chords. *Brit. J. of Psychol.*, 1911, 4, 56-88.
8. PEAR, T. H. The Classification of Observers as "Musical" and "Unmusical." *Brit. J. of Psychol.*, 1911, 4, 89-94.
9. SANDER, P. Das Ansteigen der Schallerregung bei Tönen verschiedener Höhe. *Psychol. Stud.*, 1910, 6, 1-38.
10. SHAMBAUGH, G. E. Die Frage der Tonempfindung. *Arch. f. d. ges. Physiol.*, 1911, 138, 155-158.
11. STUMPF, C., u. HORNBOSTEL, E. v. Ueber die Bedeutung ethnologischer Untersuchungen für die Psychologie und Aesthetik der Tonkunst. *Bericht über den IV. Kongress f. experim. Psychol. in Innsbruck*, 1910. Leipzig: Barth, 1911. Pp. 256-269.
12. STUMPF, C. Konsonanz und Konkordanz. *Zsch. f. Psychol.*, 1911, 58, 321-355.
13. STUMPF, C. Differenzttöne und Konsonanz. (Zweiter Artikel.) *Zsch. f. Psychol.*, 1911, 59, 161-175.
14. URBANTSCHITSCH, V. Ueber den Einfluss von Schallempfindungen auf die Sprache. *Arch. f. d. ges. Physiol.*, 1911, 137, 422-434.

SPECIAL REVIEWS

PSYCHOLOGY OF ADVERTISING

The Relative Merit of Advertisements. EDWARD K. STRONG. New York: The Science Press, 1911. Pp. 81.

Strong set out to compare advertisements as to "pulling power," "attention value," "persuasiveness," etc. In the main, his subjects were college students, but in certain experiments individuals from other classes of society were included. His materials were piano, soap, breakfast food and vacuum cleaner advertisements. A special study was made in the case of fifty Packer's Tar Soap advertisements.

The following are the chief results which may be gathered: An advertisement should be half picture and half copy. Direct appeals are better than indirect appeals. The strongest appeals are those which are strictly relevant and then come more general appeals to instincts and habits of life. College students represent the educated classes of the community, but do not represent the smaller towns and farming districts.

The prominence given to the purely mathematical part of the work has rather overshadowed the remainder, or, to put it otherwise, qualitative distinctions have been sacrificed to quantitative distinctions, a procedure which is always detrimental to good psychology. The comparison between two experiments by using the mean in one, and the median in the other, is not even good statistics.

The following statement occurs in connection with the Packer advertisements: "Take for granted that each advertisement represents a different make of soap." It is submitted that such inhibition is impossible except in a specially trained subject and even then not always, as the maker's name is prominent on each. Any detailed introspection is lacking, so that the very characteristic of a psychological experiment is lacking.

Taking Strong's study or procedure as typical rather than specific, attention may be drawn to some work which is being called "psychology of advertising."

Even if done in a psychological laboratory, such investigations are not psychological, for they tell us nothing about the psychological

factors which make an advertisement good or bad. It is cheerfully admitted that such a line of investigation gives many useful facts. The method used here was the rough comparison of advertisements according to "attention value," "pulling power," etc. A glance at the results shows that many of them are already known or are of such a nature as can be ascertained without any previous training in psychology.

When we compare a series of advertisements and place "reliability first" "cleanliness second," etc., as the case may be, we are not contributing to the psychology of advertising. To do that, we must ascertain why such terms take first or second place. These terms are not psychological and instead of being put down as results, they should be the objects of inquiry.

Take "attention value." Strong has given no hint as to any measure or criterion and at best it seems but the vague opinion of the observer, which in the case of the "negro elevator man" cannot be credited with the superlative of accuracy.

By a conglomeration of vague preferences, under still vaguer headings, we can never reach the psychological bases of appeal. A psychology of advertising can only be realized by a keen analysis of the conditions, not by a mere catalogue of those conditions.

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MENTAL MEASUREMENTS

The Essentials of Mental Measurement. WILLIAM BROWN. Cambridge: University Press, 1911. Pp. 154.

The book consists of two parts, the first dealing with psychophysics and the second with the use of the theory of correlation in psychology. Part II. is a reprint of the author's doctorate thesis and was reviewed in the January, 1911, number of the *American Journal of Psychology*. Part I. begins with a discussion of the possibility of mental measurement and the author states the reasons why he believes that such measurement is possible. Then follows a description of the different psychophysical methods. The method of constant stimuli is described in some detail and with great clearness. There is a misprint in the observation equations on p. 30, where only one side of the equations is multiplied with the coefficient of weight. Curiously enough the same misprint occurs in Titchener's *Manual*, Vol. II., Part I., p. 102. Brown gives Müller's table of weights as well as mine, which is inconsistent, since only one

of the tables can be correct. It may be mentioned in this place that many of the values in Müller's table are incorrect, since they are out by the unity or more of the last decimal place. The connection between the method of constant stimuli and the method of just perceptible difference is made by my formulæ.

The last part of the chapter on psychophysics is easily the most interesting. Brown proposes to apply Pearson's general formulæ to the study of the distribution of the threshold. This idea—though very obvious to any one acquainted with Pearson's work—is new and it ought to be tried on a large and trustworthy empirical material. Such an investigation is bound to give interesting results and it is to be hoped that the author may soon supplement his book by some such work. It is very important to see how an idea works out in practice and it also is important to know how much work the practical application of a method requires. For this purpose all the necessary calculations ought to be given in detail.

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DISCUSSION

REACTIONS TO VISUAL AND AUDITORY STIMULI

In his summary of the work of Dunlap and Wells¹ on "Reactions to Visual and Auditory Stimuli," Dr. Herbert Woodrow mentions the fact that while in the case of simple sensory reaction to visual and to auditory stimuli the former were found to be the longer, it was also found that reactions to sound and flash simultaneously presented (the reaction being to the flash, and the attention being concentrated on it exclusively during the preparatory interval) were almost as short as simple sound reactions.

Dr. Woodrow says that this circumstance naturally indicates that when the reaction was ostensibly to the flash, it was actually to the accompanying sound simply, and adds the bare statement that the authors did not accept this explanation.

In the paper in question, our reasons for not accepting the simple explanation were definitely assigned (p. 328), being based on a second set of experiments which was planned to throw light on the results of the first set. The results of this second set are fully given in the paper in question.

The reactions in the second set were with discrimination. In one group the reactions were to flash *plus* sound, flash attended to (*Fs*) discriminated from sound alone (*s*). In another group the reactions were to flash alone (*F*) discriminated from sound alone (*s*). In each series the numbers of both kinds of stimuli were equal, and the sequence in the series was determined by the order of a well-shuffled pack of cards. In these series it was found that the reaction to *Fs* was considerably shorter than the reaction to *F*, although the discrimination control rendered it out of the question that ostensible *Fs* reactions should really be *S* reactions.

While, as we pointed out in the paper, the results of these experiments are meager from the numerical point of view, and do not warrant even a provisional positive conclusion, they are of sufficient importance to prevent acceptance of the simple explanation above mentioned, and to point out a line for research.

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¹ PSYCHOLOGICAL BULLETIN, 1911, 8, 387-390.

BOOKS RECEIVED DURING FEBRUARY

- MACVANNEL, J. A. *Outline of a Course in the Philosophy of Education*. New York: Macmillan, 1912. Pp. ix + 207. \$.90 net.
- HORNE, H. H. *Free Will and Human Responsibility. A Philosophical Argument*. New York: Macmillan, 1912. Pp. xvi + 197. \$1.50 net.
- BOSANQUET, B. *The Principle of Individuality and Value*. London: Macmillan, 1912. Pp. xxxvii + 409. \$3.25 net.
- WIRTH, W. *Psychophysik. Darstellung der Methoden der experimentellen Psychologie*. Leipzig: Hirzel, 1912. Pp. viii + 522. Mk. 18, geb. Mk. 20.
- BODEN, F. *Die Instiktbedingtheit der Wahrheit und Erfahrung*. Berlin: L. Simion, 1911. Pp. 80. Mk. 2.50.
- Jubiläums-Katalog der Verlagsbuchhandlung Wilhelm Engelmann in Leipzig, 1811-1911. Leipzig: Breitkopf & Härtel, 1911. Pp. iii + 447.
- DAWSON, JEAN. *The Biology of Physa*. (Behavior Monographs, 1, No. 2.) New York: Holt, 1912. Pp. 120.
-

NOTES AND NEWS

PROFESSOR JOHN B. WATSON, of the Johns Hopkins University, has recently been granted a three years' appointment as a research associate of the Carnegie Institution of Washington. In this capacity he will study the migratory and other instincts of the sea-gulls of the Tortugas, Florida.

DR. BIRD T. BALDWIN, now professor of education at the University of Texas, is to have charge of the new department of psychology and education which is to be established next year at Swarthmore College.

THE PSYCHOLOGICAL BULLETIN

GENERAL REVIEWS AND SUMMARIES

PATHOPSYCHOLOGY AND PSYCHOPATHOLOGY

BY DR. ADOLF MEYER

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I

The last year has brought to us the emphasis of a new contrast in our field, viz., the opposition of pathopsychology and psychopathology.

A mere creation of contrasts not infrequently helps in bringing otherwise vague perspectives to clearer attention, especially so in the discussions of broader issues. Often enough the generalities are of a kind which need not touch the genuine worker who can readily leave them to the time when enough facts are available to make a conclusion easy, and who in the meantime trusts the sound trend of the day or the vogue of the programs of our scientific societies. At the same time, if a beginner or the average worker *has* the chance to grasp clear starting points and perspectives, he is bound to be better off than if he moves in a groove made by others or yields to temptations which may unnecessarily check or side-track his soundest instincts of reaction to the world of facts. And where a branch of science is just beginning to shape itself, the neighbors—in our special case, the psychologist and the physician—will be better able to appreciate the attitude of new departments in a measure as there is clearness about the starting-point and perspectives; for to take success as the only test merely opens the door to the deplorable flood of uncritical psychopathologies which struggle for the supremacy in the public eye, not without effects upon the more scientifically minded workers.

In previous numbers of the BULLETIN an effort has been made to review especially those topics which promised to have an influence upon the geographical and political map of systematized science and what we might call the interstate relations: psychopathology as nosology and as non-dogmatic pathology in 1904; then the evolution of a possible dynamic standpoint; the development of the association-experiment, and of the interpretation of cerebral integration in aphasia and apraxia; the psychological experiment in psychopathology, and more special problems, such as the feeling of reality (1905); aphasia, and the relation of emotional and intellectual functions in paranoia and obsessions, and the psychopathological development in association studies (1906); next the psychogenic factors in the development of psychoses, and misconceptions of a dogmatic "medical psychology" and the "revisions" of aphasia (1907); and finally the criticism of nosology and mental dynamics in 1908, and in 1910 the Freudian psychology. These were the leading topics discussed by the contributors of the psychopathological numbers of the BULLETIN. Today we are confronted with a double current manifested in the assertion of autonomy of introspective psychology and also the creation of a contrast of pathopsychology and psychopathology, which may or may not complicate the already complex path of the domain of concern to us. The latter comes out most strongly in the new *Zeitschrift für Pathopsychologie*, edited by Wilhelm Specht; and I also wish to discuss in this connection some reflections on the kindred current in recent psychology, as far as it is apt to influence the worker in mental disorders.

II

In his preface, Specht urges that the way from psychiatry to psychology must necessarily pass through philosophy. The chief factor of retardation of psychiatry is the materialistic dogma of the epiphenomenal nature of "psychics" (des Psychischen). Psychiatry must learn to surrender its one-sided focusing upon the brain and must learn to apply psychological methods to mental diseases. On the other hand psychology must accept the wealth of opportunities and the kind of broadening out which, in its way, pathology has given to physiology. English and French philosophy (Maudsley, Taine and Ribot, and lately also Bergson) has long appreciated the importance of pathology for psychology; Störing and Oesterreich and others have created psychological studies in pathology in Germany; a few alienists have at least developed a psychologically

more refined symptomatology, and others promoted a deeper psychological understanding of diseases. But "in psychiatric circles not even the essential difference between mere clinical experimental psychology and pathopsychology is clearly grasped." To them to speak of function is merely an admission of insufficient anatomical knowledge. Thus it happens that a reduction of the facts to terms of function in a truly psychological sense is only in its beginning. With his *Zeitschrift* he wishes to give the study of mental diseases a new foundation by bringing the psychologist and psychiatrist together in the work of pathology of mental life on a really psychological foundation, in a pathopsychology, dealing with the pathology of the *individual consciousness*, and also with the psychology of abnormal conditions and creations of *society*.

On pp. 4-49 Specht gives a full discussion of the program of pathopsychology. He shows how a careful description and analysis of the pathological phenomena in mental diseases are possible only through penetration into the mental mechanism of the disorders.

Without wanting to discuss why, with all its productivity, "psychology as developed under the leadership of Wundt does not seem to succeed in establishing theses which would be teachable and generally acceptable," and without taking sides in the recent disputes concerning the experimental method, Specht wishes to show first wherein the pathological method is preferable to the experimental method. He concedes to such a philosophical critic as Husserl (*Logos*, I, Heft 3, 1910-11) a whole range of problems (the essence of psychics, the nature of our understanding other minds, the relation of psychics to a self, the question of the independent existence of thought or of degree of consciousness, etc.); they cannot, he thinks, be settled by observation or experimentation; "they belong to the epistemology of psychics and precede inductive psychology as philosophical propædeutics of psychology or as the phenomenology of psychics"; but he finds an ample field for the experimental method in the search for lawfulness wherever the task is one of the *inductive* science of psychology, whether it does or does not turn its attention especially upon the introspective issues.

The aim of all experimentally modified introspection is to single out or to eliminate certain components. In the normal, this is only approximately possible; perceptive and recognitive functions cannot be dissociated in the normal; nor can a somatic memory of Bergson be completely cut off from the representative memory in the normal. Pathology however furnishes exactly such dissociations. Only

pathology knows of states in which a hand although anæsthetic may nevertheless recognize an object; or in which recognition may be eliminated while perception and memory are preserved; or in which objects given to external perception give up their claim to be present; or in which the realization of a motor intention becomes dependent upon actual concepts or memories of motion; or in which (as in hallucinations) the meanings are no longer founded on sensory contents, but where an already prepared intention of meaning seems to slip in between sensation and content. Normal psychology can at best come near such an elimination, or solution of continuity, or perversion of functions, but it never can realize them completely. For some reason Specht is however exceedingly cautious about his applications and somewhat arbitrary. "There follows from this a negative and a positive rule concerning the significance of pathology for psychological science. Wherever there are phenomena which only occur in pathological conditions, an immediate application of pathology to psychology is not admissible." Hallucinations for instance are considered as strictly pathological phenomena, devoid of all transition through illusion to normal perception. "Similarly it is pathological when volitional intention requires motor images for the realization of its content." The phenomenon of the positive after-image has been too rashly used for false theories of sense-perception and even for metaphysical theories on the subjectivity of the contents of perception. The association psychology should not appeal directly to the findings in mania and in intoxication; and the doctrine of the mind-substance should not be considered as refuted by the dissociation of the ego in hysteria, lest one ignore the fact that these conditions are abnormal and "that there are also occasional thinking, non-intoxicated and non-hysterical personalities." The physiologist would err in a similar manner if he described the elimination of albumen as a function of the kidney and not merely a function of the diseased kidney.

There is no doubt that Specht is justified in drawing the attention to the necessity of reserve. It is necessary to check the uncritical and to cultivate a certain respect for the concrete situation of any special type of occurrence as opposed to the license of untrammelled generalization. Passing to the positive rule, Specht shows how the perception of things by an anæsthetic hand endorses Külpe's rehabilitation of the inner sense and how it warns against sensualistic generalization which minimizes the difference between recognizing the *thing* and recognizing the tactile sensations. Or (p. 14) he shows

how, notwithstanding preserved capacity of perception and of *remembrance* of previous perception, recognition can be lacking; and that abolition of visual memory does not entail mind-blindness, so that Bergson's contrast of memory for motor utilizations *and* of independent memories is more justified than the current explanations such as those of Lehmann (*Phil. Stud.*, Vol. V.). This does not call for a wholesale transfer of conceptions from pathopsychology to psychology; it is a broadening of the world of facts on which general theories should be brought to a test. In my own mode of expression I should have to emphasize the *respect for the concrete situation* and the mistrust of any "absolute" generalization which would want to be anything more than a more or less comprehensive simplification of our concrete picture of the world and our experience. If we bear this in mind, some of the points specified above as warnings may not have to be brushed aside in as final a fashion as Specht seems to feel obliged to do, as with regard to the hallucinations and the artificial reproduction of "flight of ideas," etc. They, like the *favoured* instances of acceptable generalization, will stand or fall according to whether they will stand the tests of repeated experimentation and analytical penetration.

Pathology adds to our knowledge not only by eliminating certain connections, but by the independent variation of various functions (or, as I should put it, of various integrated factors). It does for us what caricature and the experiment do, and it suggests new channels of work and new viewpoints. Specht certainly makes plain "the value of pathology as shown by elimination of functions" and "the narrowness of the thesis that normal mental life should not be explained from the pathological side."

Specht (p. 16) next passes to the question of *what rôle can pathopsychology play in the business of psychiatry* (which is the "discrimination and cure of mental diseases"). With the dogmatic assurance shared by Münsterberg, Specht claims that medicine ceases to be a *medical science*, if it ceases to prove that a patient asking for treatment has this or that *disease*; the knowledge of the "disease" and the knowledge of the causes calls for the baths, medicaments, psychotherapy, etc. Psychiatry thus must make it its business to recognize and cure mental *diseases*.

Specht accepts the establishment of absolutely distinct disease entities as achieved (?), and also the demonstration of some definite etiologies; but he deplores the hopelessness and dogmatic pessimism which spurns the psychological concepts even in the functional dis-

eases and there can reckon merely with "brain diseases in which we are still ignorant of the lesion," and which is apt to see only in these "physical" processes realities, even though they may be merely hypothetical, while the psychic facts figure as mere epiphenomena; so that the psychiatrist maintains a passive attitude wherever he does not find a point of attack upon the gross or molecular changes in the brain. In the mind of the "psychiatrist" even mental influences can have a beneficial effect only through the influence on the molecular conditions with a secondary effect on the mental state (Specht illustrates this position by Kraepelin's attitude). In contrast to this, Specht wants to restore their reality to the psychic data, and he does not want to wait for the day when a drug will be available to counteract a melancholia as a drug counteracts constipation; he wants to recognize mental diseases as mental diseases and study them for *psychical* causes (if they exist) and a corresponding therapy, or for physical causes when physical causes exist; and he wants to distinguish brain diseases and mental diseases (rather than "organic" and "functional" diseases). "Brain diseases" and "mental diseases" are not altogether synonymous with "exogenous" and "endogenous" disorders; but in the one, therapy attacks the *brain*, in the other it attacks the *mind* (in which I should emphasize conduct and behavior). Only experience and the facts will decide which conditions belong to the one and which to the other group. While nobody would exclude the possibility that some day a drug might affect the brain in exactly the necessary way to bring about even the mental changes required, a study of the psychogenic mental disorder from the mental side in the meantime is to say the least absolutely justified, even if, as in dementia præcox, the deterioration speaks definitely for an involvement of the brain tissue in the decline.

Lack of space forces me to give only a limited summary of the well written arguments of pp. 16-49. They form a counterpart to my own statements in earlier years of this BULLETIN. Specht gives a very lucid discussion of the necessity of a more plastic and functional conception of "disposition" which makes different persons react differently to the same difficulty (as, *e. g.*, different women would react differently to marital infelicity), and he formulates the treatment as an attempt to make the patient see things in a wholesome light—not through blunt arguments but through helps which help. He appeals to the psychiatrist to approach his work free from all dogmatic presupposition and to depend on what he finds by experience, to recognize psychogenic and non-psychogenic disturbances and with

this the existence of mental causes, seen both in the production and in the remedial modification of disease. It is quite characteristic that he harks back to some psychiatric voices of sixty years ago, before the anatomical fascination created the doctrine of exclusive salvation in putting all psychopathology in terms of hypothetical brain-changes.

Specht errs if he claims that Freud's somewhat over-systematized psychopathology is the only attempt in this direction in modern psychiatry. He is not informed of the work in the *PSYCHOLOGICAL BULLETIN*. And I must confess that the recent discussion of the introduction of psychology in the medical curriculum shows a broader and freer development than the one under which Specht feels justified to introduce his new journal. He certainly does not make clear *how* he promises help to the psychiatrist who should find his way to psychology "through philosophy." Will that become clear through his philosophical contributor?

III

Münsterberg ("Psychologie und Pathologie," pp. 50-66) takes up the methodological issues. He complains of the continual careless intermingling of the two expressions, psychopathology and pathopsychology (or, he might possibly have said more justly, of the promiscuous use of the word psychopathology where M. would prefer the adoption of the term pathopsychology). An investigation may be of importance to both psychology and to pathology, but it naturally is logically differently focused according to whether it aims to serve a knowledge of the mental phenomena or of the diseases. He peremptorily assumes that *qua* pathology any mental disorder must be viewed as "symptom of some definite disease," while *qua* psychology it is treated as a variation of other similar *mental* variations.

Pathopsychology at once appears under two sets of conditions. Psychology may be furthered in its intrinsic problems by studying the abnormal states and processes beside those of normal life; on the other hand it may draw in pathology (I should say nature's experiments) for the purpose of interpreting normal mental life (I should say mental life in general). "In the one case the relation to pathology yields a special *group of problems*; in the other case a special *method* for psychology. Both result in a gain of purely psychological knowledge and therefore constitute pathopsychology; but they form two different fields of work which coincide only in certain points," very much as the psychology of normal life and experimental

psychology. The same kind of contrasts can be made in animal psychology and in physiological psychology (and M. might say also in pathology itself when it studies constitutions as well as the specially definable processes or "diseases," or when we compare its descriptive-analytical part and the experimental pathology).

Pathopsychology thus studies the mental processes occurring in disease not as symptoms of diseases but as deviations from the normal course of mental life and for the gain of purely psychological knowledge, partly to broaden the field of facts (a special group of contents) and partly to explain normal mental life (as a counterpart of experimental psychology in a new field, or as a special method). M. urges the verbally plausible contrast between an extension of matter and an extension of method.

By giving up the concept of disease and morbidness, pathopsychology according to M. "encounters considerable methodological difficulties." The contrast of health and disease is logically simple. Health and disease necessarily refer to biological conditions and are concepts borrowed from general pathology, which is based on diseases of the body; a special adaptation to the psychical conditions is therefore not necessary for the concept of "disease." Whatever damages the self-preservation of the organism is morbid whether it shows in the purely physical domain or in part also in the mental field. "Hence the concept of what is pathological" remains absolutely dependent on the vital conditions of the physical body even when we are concerned with psychology, and it does not require any special adaptation out of consideration for psychics. (The reader will see that all this resolves itself to the traditional conception that there are no mental "diseases" but only physical "diseases" and to M.'s views concerning causality.)

In the mental domain proper we can only speak of normality and abnormality, *i. e.*, reference to mere *averages* (which would be lowered in case of increase of insanity) or to an *ideal of harmony* of the mental forces. Abnormality and disease are not parallel concepts: a genius is abnormal but not pathological; from a teleological-psychological standpoint dreams should be looked upon as abnormal and yet not a pathological symptom, but on the contrary, with some psychopathologists, a really important help to the normal organic functioning; whereas the euphoria of the consumptive may be pathologically part of the disease but is psychologically normal. In "suggestion" the abnormal begins "where the hypnotic influence sets in," or in blindness or deafness "where they modify a mental life"; yet neither

of these abnormal states turns on the notion of disease. "Pathopsychology will attempt to explain the whole range of the abnormal with the helps of the normal psychology," and by using its knowledge of memory, of attention, of feelings, of volition. To all this we might say that to the psychologist, as to the scientist generally, normality and abnormality can no longer be a primary scientific issue. Science must generalize the venerable declaration of breadth in "*Nihil humani a me alienum puto*," and it must accept the fact that this broadening out is to be allowed without *a priori* restrictions—for who knows what the investigator may find and what he must be ready to meet. At this point, M. properly criticizes the use of the term "applied psychology" for pathopsychology, which would be as inappropriate as calling the psychology of myths, of morals, and of languages, applied psychology. So much for M.'s discussion of pathopsychology as "psychological penetration of the abnormal psychological phenomena."

M. next takes up pathopsychology as determined by the *methodological* viewpoint. "It is the entire psychology as far as it is furthered by the study of abnormal and especially pathological phenomena," especially where clinical observation gives insight into the psychical mechanism. But M. evidently still assumes that whatever mental phenomena occur in disease must, in pathopsychology, be viewed as an exaggeration or a reduction of the "normal."

Psychopathology is "quite different"; according to M. it turns absolutely on the concept of "disease." As far as it studies special contents, it takes up the special mental symptoms in specifically mental diseases and also in other diseases. As far as it takes the methodological viewpoint, it deals with the entire domain of human diseases as far as its study can be furthered by the consideration of mental facts and psychological knowledge. "Here then the normal mental attitude is the real starting point. We may take as an instance the much-disputed mental tests which try to elucidate a pathological behavior in the domain of a simple measurable activity by comparing it with the normal typical condition," etc.

The four fields are further complicated by the physiopsychological and psychophysiological correlations and substitutions which must be made problems "clearly kept apart."

M. next turns from the theoretical field to the union of psychology and pathology for practical results in the service of hygiene and pedagogy, in psychodiagnosis and psychoprognosis, or in the diagnosis of mental states by non-psychological means, or with the help of

normal-psychological demonstrations (as in the disorders of intelligence). Even for the study of peripheral and spinal diseases psychological methods (tests of sensibility or motility) may be used. Even broader is the field of therapy in the form of "psychiatry" and "psychotherapy." Psychiatry may use baths and non-psychological helps; psychopathology uses mental influences against mental and physical disorders (such as digestive disorders, etc.). As a specially promising category M. suggests the psychological experiment on the normal in the interest of psychology but under the direction of pathology. Kraepelin did the reverse; now should come the turn of the use in the normal of what, for instance, special studies of amnesia have suggested.

"It would, however, be methodological confusion to expect that pathological observation could throw any light on the fundamental questions of psychological conceptions." The experience with suggestion could not possibly further the theory of the relation of mind and body; of a great share (?) of Freudian literature he claims that it is pervaded by the thought that psychoanalysis furnishes evidence of a causal action of psychics "independent of brain-processes," and that for this reason it vainly assumes that the psychophysical parallelism is overcome. It is also futile to expect that one could in any way justify the psychological concept of the unconscious by facts in pathology, or a decision on whether psychological analysis finds merely elements of content or also elements of function, or whether there are various degrees of consciousness, etc. Not one of these questions can even be touched by any pathological study as little as by the normal psychological experiment. All this can be as little a problem within psychology as the problem of time and space can be a problem of physics.

To an active investigator in psychopathology, these discriminations may be pleasing if he agrees with the dogmatic foundations from which Münsterberg chooses to start. If, however, he should have relegated the concept of a "disease" to the category of mere convenient medical logic in nosology, while at bottom in his pathology he only recognizes conditions and factors at work in experiments of nature and reaction-types worth defining (see *PSYCH. BULL.*, 1908, 5, 245-261), he may easily come to feel obligatory nosological assumptions a hindrance or at least an encumbrance of doubtful value, something needing more help itself than it can possibly give in pathology. With a profound respect for the helps of logic and critical definition of problems and epistemology, I do consider it essential

that the first thing to aim at is sufficient accuracy and clearness of work, just as we demand it (together with rigid clearness) as we embark on a bacteriological or chemical analysis or a logical elaboration of data. For all this a first-hand familiarity with the facts and with the fundamental methods in use must precede whatever subsequent philosophical consideration one wants to introduce. Only if that is granted does the help and critical training of the philosopher come in good stead; otherwise its contrasts smack of word-play and logomachia.

The psychologist and the pathologist who take up the study of a depression, or of an hysterical repression, or a psychasthenic rumination will do well to ascertain the facts, determine their actual interrelation in a chain of causes and effects (*i. e.*, in terms of an experiment of nature), and then they analyze the relative rôle of each link and the modifiability of the links and of the whole chain—and all this can be done without speaking of “symptoms of a disease” or a discussion of what is “normal.” Fundamentally both the psychologist and the pathologist, if there are such in pure culture, must take all the facts into consideration to be on a strictly scientific basis; the difference will only show in the emphasis on various groups of facts and their interrelation, and in the grouping of the material; and the value of the one or the other emphasis and method can only be an issue of economy and accuracy in the procedure, but not something radically different, unless, of course, we start out with a psychologist who knows of no causality in his realm, and a pathologist who treats psychics by elimination. The very transformation on this point is the fruit of work with facts and the adaptation is far from being aprioristic, as Münsterberg seems to demand. It is after all the facts which call for the making of categories or for their simplification or readjustment, and the preliminary result next may call for logical-philosophical sifting.

The discussion is given so much space here because it makes one long for the passing of aprioristic specialism. First-hand work must more and more become the condition for the whole range of verbal and conceptual permutations of psyche, pathos and logos, and the ramifications will be considered safe or in need of more or less modesty and reserve, according to the extent of a writer's first-hand mastery of work in the integrated fields—biology, physiology, psychology, logic and what not. I feel that I must be in perfect harmony with M. on this point: that it will be considered more and more hazardous and dilettantic to make claims in psychology or in pathology without a

fair working knowledge of the working elements of both. As long, however, as the working knowledge is safe, we can trust continued work better than the continual creation of methodological contrasts. Where does the system of logical permutation lead us?

The claim of Specht that the way from psychiatry to psychology must necessarily pass through philosophy, receives a peculiar illustration in M.'s essay, and it makes one ask seriously: Is it not chiefly a warning against *mere* philosophical method and against too much awe of accepted philosophical rules that is needed in this field?

IV

Oswald Külpe, who deplores the lack of support for psychology as an independent science and department in German universities, offers a practical contribution in an article entitled "Psychologie u. Medizin" in the second number of the *Zeitschrift* (Vol. I., pp. 187-267). He brings very pertinent criticisms of methods and results in recent studies in psychopathology by Isserlin, Binet et Simon, Oesterreich, Liepmann's study of flight of ideas, the problem of mind-blindness, and a program for the examination of mind-blindness. It shows what a wealth of detail is suggested by the systematic and critical consideration of the introspective material. It also shows the distance between the naïve medical attempts and the searching demands of the psychologist who is experienced in what we might call psychohistology; but also the interesting limitation of non-mental issues in his considerations.

Another study of a more concrete character is that of Pick, who presents a most interesting case, showing the rôle of the relation of perception to the self—a patient who went through attacks in which he saw the city as he used to know it and experienced peculiar panics during the conflict of the hallucinations and the real perception of the city as it stood before him, when he could bring himself to help his vision by touch or by rapping a gate or a building with his stick. From very interesting records of the introspection of the patient he shows how important in the conflict between obsessive visual memories or hallucinations and real perception of the real outside world the activations of other sense-mechanisms (and we might also add the motor mechanisms) become.

These studies plainly concern themselves with only a limited field of what psychology will meet in abnormal situations. They do not come out plainly as a new and exclusive method, but as more

conscientious and well-considered efforts to do justice to introspective material, such as must also appeal to one who strives for precision in a non-dogmatic attitude concerning psychology and its relation to science. The last two years have however emphasized more pronounced types of reëmanicipation of psychology into a strictly autonomous position.

One of the ablest German psychologists, Narziss Ach, of Königsberg, says at the end of a discourse "Ueber den Willen": "Die experimentelle Psychologie selbst ist zwar keine Naturwissenschaft, denn den Gegenstand ihrer Untersuchung bilden die geistigen Vorgänge, aber sie benutzt naturwissenschaftliche Methoden zur Festlegung der Gesetze dieser geistigen Vorgänge, etc."

This is the German version of the attitude most emphatically voiced by Yerkes in this country. In his analysis of the replies of physiologists and biologists on the relation of psychology to biology (*J. of Philos., Psychol., etc.*, 1, 113-124) and in his *Introduction to Psychology*, Yerkes feels forced to assert what I might call an overcorrection of the ordinary training which tends to disqualify the average person for a naïve and direct use of the introspective material of experience. Yerkes, from conviction or for didactic reasons, is intent on making the student cultivate the view of a world divided into two distinct aspects, psychics and physics; to both of which he can apply the fundamental methods of the natural sciences. Observation under natural and experimental conditions, quantitatively accurate and verifiable description, and causal explanation.

In my own words, without a radical division of psychics and physics, psychology, in the normal, or the abnormal, aims at sufficient differentiative description of these events, determination of the conditions under which they arise and the conditions the events lead to and the law of their modifiability; in other words a reduction to experimental terms or to experimental function. Psychology as a study of events would then be opposed to the consideration of merely logical or at least adynamic relations, and will have to deal also with non-introspective material. Any such effort necessarily presupposes sufficiently organized living beings in action, and as long as the reactions have dynamic factors involved, they can be studied in terms of experiments (not merely in experimental situations); if the dynamic factors are eliminated, a chiefly logical treatment begins, hence the view maintained by Münsterberg that psychology knows only of purposive relations, while the causal chains are observable only in the physical side of the events, which, of course, leaves psychology, as he conceives it, in clear opposition to *Naturwissenschaft*.

It is of course conceivable to think of the states of various degrees of abnormal synthesis in the same terms as of those of normal and not further conditioned mental life, purely in terms of relational and logical sequences or in the mode of psychologizing of common-sense when it leaves outside of the sphere of discussion the non-mental series of physiological or biological events or integrated material. One might go so far as to make sure that the differences in the time-relationships which evidently characterize the different physiological states in a general way, should be expressed in terms of "psychological time" and create a picture of a world of pure introspection. This might be a natural extreme of consistency for the psychologist who enters psychology from the philosophical camp; but for one who approaches it from the field of direct objective as well as subjective experience, without going through the phase of "secondary naïvety" of the philosophical standpoint, this temptation is assigned a secondary place and the emphasis is put upon whatever standpoint gives us the best definition of the conditions under which the matters under discussion occur, and under which we can study them as modifiable factors of experiments.

I cannot help referring here to an exaggerated instance of a pathopsychological study, the quaint book of M. Herz (*Kritische Psychiatrie. Kantische Studien über die Störungen der reinen speculativen Vernunft*. Wien, 1895). Oesterreich's *Phaenomenologie des Ich* would form a more modern type, and also an illustration of a tendency which insists on the "total heterogeneity of psychics as opposed to the processes of external nature."

On the other hand, I am tempted to interweave here a brief abstract of what I should call the direct and naïve call of a physician for a psychology which he can grasp and which is part of his practical and theoretical world. In the main his contentions can readily be compared with Specht's appeal for a psychopathology which recognizes causal chains among and within the mental events.

Koertke (*Somatische Medizin und Psychologie in der Psychiatrie*. Mitteil. aus d. Hamburgischen Staatskrankenanstalten, 1910, 11, 1-17) reviews the uncertainties of psychiatric nosology, cerebral histopathology, the insufficiency of psychological and histological correlations, the improbability of getting far with the mere concept of cerebral localization. He analyzes especially the supposed parallelism between general paralysis and dementia præcox, and the preponderance of a kinship with hysteria and absence of a progressive condition describable in neurological terms in dementia præcox; the need of a

special accounting for the mental symptom-complexes even in general paralysis, and the dreary effects of formal routine diagnoses of dementia præcox which prejudice the physician against the case and throw the patient into the ranks of mere inmates. He urgently calls for a psychological penetration of the cases, points to the advantages of the association-method, not only for the study of hysteria and neurotic states, but for a more intimate knowledge of any case. The psychiatrist cannot afford to be a one-sided physician but must also be a psychologist.

This is in many respects a trend of thought akin to that developed in the decennial lecture at Clark University, or the dynamic interpretation of dementia præcox (*Amer. J. of Psychol.*, 21, 385-403) in which von Voss sees merely Freudian speculations and a one-sided psychological interpretation of the disease, "unintelligible considering the great number of physical manifestations," as if the habit conflicts referred to were one-sidedly psychical unless one expurgates the whole mass of incidental and absolutely intrinsic motor and vasomotor and glandular functions and perversions involved (*Jacobsohn's Jahresbericht*, 14, 1054). Who can blame a critic who only knows the orthodox tenets of a psychology without a body?

V

The appearance of pathopsychology is a somewhat surprising secession and declaration of independence of psychology in the field in which the possibility of a blending of natural science and psychology into a really unitary science had seemed most promising. With all the recognition of discontinuity and pluralism which cold-blooded criticism has to face in a systematic account of experience, there is no doubt about convergence and growing harmony of perspectives in the direction of experimentation as the fundamental trait of modern science. It is not the *essence* of the objects of study but their *sufficient differentiation and what they do*, i. e., the rôle in chains of cause and effect, that goes at the core of what we long for. For a long time psychology had to assert itself against aggressive and sometimes brutally crude types of materialism, and the safest way *was* the complete retirement behind a partition furnished by the parallelistic dogma. Today psychology is in great demand to fill gaps which the coarse materialism has failed to touch, and it is called upon to bring lawful order into our knowledge of and experience with a great and important field of human interests, not only abstract introspection,

but the world of conduct and behavior. Those who approach it from biology and pathology naturally bring a strong interest in the conditions on which certain reactions depend for their very occurrence. Some of these conditions lie in the outside world, others in the organism of the individual and for some of the conditions we can point to states or events expressible only in terms of the symbols characteristic of conscious or mental reactions. The question then arises whether the biologically trained workers must be told that they either must change their faith or remain in the cold world of "matter," excluded from "psychics," or whether they are allowed to take with them the interests in the objective as well as in the subjective data of the science of conduct and behavior, and the privilege of using them according to the accuracy needed or the connection in which the facts appear in the chains of cause and effect. It may be that for reasons of simplicity we should favor the categorical separation of the facts by the maintenance of a rigorous parallelism. But if the simplicity leads to undue restrictions or to undesirable licenses of imagination such as the neurologizing tautologies criticized in previous articles, we are willing to accept more complex rules of procedure and a freer range to our common-sense way of dealing with conduct and behavior and its metabolism or inner mechanisms manifested in introspection and its exteriorization. Instead of dividing the world of facts and of workers into a long series of contrasting types, we specify the rules of the special procedures and keep them subordinated to the main facts and interests without any partitions such as the cumbersome division of the world of experience into psychics and physics, or into pathopsychology and psychopathology, and similar contrasts.

Psychology as the science of conduct and behavior and its mechanisms as a natural science and branch of biology, deals with that range of facts which can in many conditions leave the substrata or the strata of lower integration as "taken for granted," or as sufficiently considered, as long as the data of the psychological strata and of the external stimuli are taken conscientiously. But as soon as we leave the simplest situations, as in the variations of the mental level in conditions of fatigue, sleep, intoxications, brain-disease or even emotional conflicts, etc., it is absolutely necessary to command the facts concerning the entire integrative material, mental and non-mental. Facts which also can be studied apart, as functions of independent organs (such as the brain) or mechanism (such as the polyglandular system of regulations), must then be open to study from the point of view of the broader functions of the individual as a whole, and he

will be the conqueror who commands the whole hierarchy of sciences—from physics and chemistry to the biological sciences (including the science of conduct and behavior) and to logic or the science of relations; from the dynamic sciences with its world of cause and effect to the philosophy of which Specht and Münsterberg say that it is needed to pass from psychiatry to psychology—or we might say, to the philosophy which reflects the manner in which a worker passes from psychiatry to psychology. For it does seem after all as if the connection of the two called for a recasting of the rules of intellectual procedure and a recasting of important assumptions, too often shirked under the excuse of aversion to metaphysics, *i. e.*, to the formulation of systematized logical consequences. Whether or not experience with psychopathology will ever touch or throw any light on fundamental psychological conceptions can safely be left to the future and to the workers who have to shape their fundamental conceptions in keeping with growing experience.

EXPERIMENTAL PSYCHOPATHOLOGY

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Much has been written during the past few years concerning the mutual relations of psychology and medical science. The establishment of laboratories of psychology in hospitals for the insane, in institutions for the feeble-minded, and in universities for the examination of abnormal children has resulted in a wider and more general appreciation of the possible advantages which may accrue to both psychology and medicine by the combination. This interest has been shown to some extent by various attempts to give names to each new application or junction of psychology with one of the medical disciplines, and at present we have to deal with abnormal psychology, psychopathology, pathopsychology and clinical psychology. Many other divisions are made, and the extremes to which this attempted division may go is well illustrated in Wallin's article (14), where we find the terms "clinical psychology," "psycho-clinical," "medical psychology," and "medico-clinical" as well as psychopathology. In many instances the reader is left to judge whether or not each term is to designate something different from the others.

A practical distinction which may be made and held to is that when an investigator is concerned chiefly with the general course of a

disease and its treatment his interests are in psychiatry, but when his chief concern is the investigation of the development or interrelations of mental symptoms his interests are in psychology, and the emphasis, either on the psychological or the pathological aspect, makes his work either pathopsychological or psychopathological. This distinction is well brought out in the work of Gregor (5). In this book Gregor, like his predecessor Störing, gives a general account of the mental processes in a variety of diseases. Although it can not be said to be a complete exposition of all forms of abnormal mental conditions, the book gives a better view of the present status of psychopathology than any other single work. Here one may find a summary of many of the experimental results in psychopathology which are scattered throughout psychiatric and psychological journals, but there is a Germanic exclusiveness which slightly mars the work as a whole. Many of the chapters dealing with psychopathology have companion chapters dealing with the normal psychology of the processes under consideration which serve to bridge the gap between normal psychology and psychopathology and also to introduce the physician to general and experimental psychology. The material included in the book is mostly two or more years old, so that our review precludes the possibility of much more than mention of the titles of the chapters, which are as follows: psychology and psychiatry; psychopathology of time sense; reaction experiments; pathology of apprehension; association reactions; association experiments with the insane; methods of testing memory; pathology of memory; psychology of evidence; experiments on the psychology of evidence of the insane; psychology and pathology of attention; methods of testing attention; experimental testing of movement; bodily changes accompanying mental states; mental work; methods of testing general intelligence.

A notable omission is that of the sensory equipment of the insane, but this defect is not due solely to the author but to the great body of those who investigate the abnormal. It is strange that although psychologists have devoted much time to the investigation of sensation, little or no work of this character has been published regarding the sensory equipment of the abnormal. Psychiatrists have dealt with conduct (or movement, if you will) to the exclusion of sensation except in as far as the latter topic bears directly upon hallucinations and illusions. They criticize the psychologists for their analytic sensation work and demand the investigation of "conduct," showing thereby a lack of appreciation of the fact that "conduct" is a complex depending, in part at least, upon sensations.

In some respects the book of Whipple is an equally notable contribution to general psychopathology (15). Here psychiatrists may find details of more exact methods of testing patients than have usually been employed by them, but which for them have hitherto not been available in simple form, or which have been grouped in college text-books or scattered through many psychological journals. The partial limitation of the object of the book to the study of children prevents a full consideration of it from a psychiatric (*i. e.*, psychopathological) point of view, but many of the methods should prove useful to those who wish to examine the mental states of the insane in ways more exact than those usually employed. From personal experience, the writer is inclined to doubt the psychiatric (*i. e.*, the psychopathological) value of some of the methods advocated, and certain matters have not been taken up which have great value for the psychologically inclined psychiatrist. Many of the methods can be used with the insane only as research methods, others are very simple and of great practical value but are parts of the general equipment of those who have to deal with the insane, *e. g.*, tests for heterophoria *et al.* Because the general character of the tests which are recommended is simple, Whipple's book is much more useful to those who deal with the insane than most other works dealing with experimental method, and in this connection mention may be made of the report of the special committee of the American Psychological Association on the standardization of experimental procedure in tests (12). The committee apparently had in view the application of the methods they advocate solely to the normal. Few of the methods recommended are useful in the examination of the insane, and it is to be regretted that the part of the committee which has already reported has apparently neglected to deal with certain practical relations of psychology and has restricted its report largely to the consideration of the testing of normal individuals. Two of the topics discussed in the report may, it is true, have only a limited bearing upon problems of psychopathology, but that of mental imagery may be important in the consideration of the types of reaction, of hallucinations, or delusions, etc., of the abnormal.

Although, as indicated above, experimental psychologists have devoted a large part of their time to the investigation of sensations, Gregor's work passes over sensation disturbances, and Whipple's book fails to give indications of methods of testing some of the sensations which at times are much altered in the insane and other abnormal classes. Thus, we find no discussion of methods of testing taste,

smell, temperature and the threshold of touch. It may also be noted that in general Whipple's tests of movement are directed towards the testing of motor equipment as such, rather than to the sensations of movement, which are also often disturbed in pathological conditions, not only in the insane but also in the feeble-minded. Recent personal work, not yet published, indicates that the sensory equipment of the insane and of other abnormal classes must be investigated as of equal importance to the motor or conduct sphere, and that there are as many sensory disturbances or deviations in the abnormal as there are motor or conduct disturbances. It is surprising that psychiatrists and psychopathologists have not investigated the sensory equipment of their patients, but part of their failure to do so may be due to the fact that they have been unable to obtain from the normal psychologists data suitable to compare with their own. It is largely because of the necessity of having data on untrained subjects that some psychopathologists have been compelled to devote a large part of their time to experiments on normal, but psychologically untrained, subjects so that a direct comparison with similar results on abnormal, but equally psychologically, untrained subjects may be made. This is what the writer has been compelled to do in his work on the sensations mediated through the skin and the underlying tissues (3), for he has found no available data for purposes of comparison. The methods can usually not be as fine as those used in a purely psychological research, in other words they must be clinical. The results from this work may be little different from those on trained subjects with finer methods, and perhaps no great amount of material for theoretical psychology may accrue from the work, but it is needed for purposes of comparison as practical psychological standards. If we are to have much advance in our understanding of the abnormal and any advance in the understanding of the normal from the study of the abnormal, many tests must be devised and applied to a number of normal, but untrained, subjects and the same tests applied to the numerous abnormal classes. For example, the usual procedures of reaction time experiments can be applied to only a very small percentage of the abnormal. Sommer's tridimensional analyzer can be used with normal subjects but can not be used with many abnormal. Much simpler instruments and methods may be devised to make tests of a similar character and have wide applicability and give valuable results.

Largely on account of the value association tests have for diagnosis, the number of researches on the association of ideas in the

insane is more than on any other topic. Some of the more important of these are worthy of even more extended consideration than can be given in this review. Of the greatest value is that of Kent and Rosanoff (7). These investigators obtained 100 free associations from each of 1,000 normal subjects and have carefully tabulated the results according to their frequency values, so that the results of any abnormal subject may be directly compared with those of the 1,000 normal subjects. The grouping of the normal reactions resulted in the formulation of a table, or tables, of actual facts without the extended consideration of the logical characters of the reactions, as has been done by many previous investigators. Since this review is concerned mainly with pathological advances and methods, we must pass over the normal results and consider only the results on the 250 insane patients. The results on 108 cases of dementia præcox showed a larger number of "individual" reactions than the normal or than any other form of insanity studied; of 33 cases of paranoic conditions, a heterogeneous group, many showed no departure from the normal, and only a few cases closely allied to the dementia præcox group gave evidence of great abnormality; 24 cases of epilepsy showed many repetitions and many particles of speech as association reactions, and it is worthy of note that these cases were mostly in a state of advanced dementia; 32 cases of paresis gave varying reactions, those "presenting no considerable dementia or confusion and cases in a state of remission" gave practically normal reactions, and those showing mental deterioration showed many repetitions, associations to previous reactions, etc.; 32 cases of manic-depressive insanity showed slight variations from the normal, although there was a number of "sound reactions, word complements, and particles"; in 8 cases of involuntional melancholia no evident abnormality was observed; 6 cases of alcoholic dementia showed no evidence of abnormality; and only one of the 4 cases of senile dementia showed more than the usual number of individual reactions.

In this connection the works of Klepper (9), of Kilian (8) and of Nathan (10) deserve mention. Klepper investigated the associations of epileptics and katatonics, which types of cases sometimes have a somewhat similar symptomatology and which are, therefore, difficult to differentiate. The characters of the associations differ in the two types which were investigated. Without going into the enumeration of the logical differences in the types of reactions it is evident that there are sufficiently well marked differences, and these are so great that the author concludes that he is able to differentiate one type

from the other by the association tests alone, without having any history or case record. Kilian tested the associations of a case of manic-depressive insanity over a period of five months, during which there was a return to the normal condition. He found a gradual decrease in the number of klang and non-understandable reactions, a decrease in a number of perseverations of the associations, but there was a greater tendency to repetition of the stimulus words. Nathan worked on a case of imbecility, investigating principally the so-called senseless reactions, and found that many of these are due to sense impressions obtained or received immediately before or during the course of the experiments, others were due to ideas present in the mind of the subject, which were more or less stable and apparently personal, and some others were reactions to stimulus words given in previous tests. This study is of great psychological interest on account of its analysis of the senseless reactions, for these are more frequent than is commonly believed, and, as the writer has pointed out in another place, they can not be considered to be senseless for the subject, but senseless only as far as the logical beliefs of the experimenter are concerned.

The attempts to explain some symptoms in abnormal cases by tests of the effects of drugs, a method with which the name of Kraepelin is closely associated, have been continued in the Munich clinic. The work of Schnidtmann (13) is an account of an effort to discover the reason for certain prolonged association reactions in certain pathological cases. Seven subjects were given from 40 to 50 c.c. of alcohol, and their associations tested before and after its ingestion. One of the subjects gave shortened times after the taking of the alcohol, and the other six gave normal or lengthened times. The quality of the associations differed in the individual cases, but these are impossible to summarize in a few words. Another series of tests to determine the effects of alcohol had its origin in the Munich laboratory. Göring (4) tested the effect of similar doses of alcohol on muscular force, apprehension, and the ability to add in 18 cases (11 men and 7 women). Preliminary series of tests were made and the testing series were begun 20 minutes after the ingestion of the alcohol. The tests of muscular force were the last of the series and these were usually begun 42 minutes after the taking of the dose of alcohol. All subjects showed less ability to apprehend after the taking of the alcohol, for there were more mistakes; some were unable to add as many figures, although there were marked deviations both up and down; and the muscular force varied, sometimes being

greater and sometimes less after the alcohol. The seven women were given different amounts of alcohol, and it is not possible to make a full comparison with the men, but in general it may be concluded that the women showed more effects from their doses than did the men, and the author believes they are less resistant, probably being less accustomed to the drug. In neither of these two experiments (Göring and Schnidtmann), although valuable in themselves, can it be said that all the precautions were taken that should be taken. Rivers has shown that alcohol when taken and not recognized does not have the marked effect that Kraepelin and his pupils attribute to it, and the excellent method of Rivers, or a similar one which would give as good control, should have been used in these experiments if the results are to be accepted as they stand. No account of Rivers' work has been taken, or at least the later work of Rivers is not mentioned, and since we know from that work how great an influence upon the reactions "knowledge" may have, we are not justified at present in concluding that the results of the work of Schnidtmann and Göring are more than suggestive.

The application of psychological methods to the investigation of therapeutic procedure has been made in the work of Busch and Plaut (2), who investigated the effect of continuous warm baths upon pulse rate, on temperature, on blood-pressure, on muscular force, on associations, on choice reaction time, on apprehension, and on addition ability. Baths of two hours' duration were taken and the effects of these were investigated in relation to the above mentioned processes in 3 normal subjects and 2 hypomaniacal subjects. In general there was a slight increase in temperature, no noticeable change in the pulse rate, and a slight decrease in the blood pressure. The results with the ergograph (muscular force experiments) were varied, sometimes a greater force than normal was obtained, and sometimes the force was less than normal. The choice reaction time was varied but little, if at all; the accuracy of apprehension was increased about 2 per cent. after the bath; the ability to add was also slightly increased; the character of the associations is difficult to estimate and to summarize. All the results are within the normal variation, and since this is so, the effects of prolonged baths on normal and slightly abnormal individuals may be judged to be insignificant. That such therapeutic measures have a quieting effect upon certain excited cases there can be no doubt, and the present work is of value in that it gives a basis for comparison with the more disturbed of the psychiatric cases.

The results of Ranschburg's study of memory (11) are of importance for normal and pathological psychology. The method used in the work is that of word pairs, the subject being given pairs of words in a series, and after the series is completed is given the first word of each pair and asked to supply the second word. Five series were made with 6, 6, 9, 9, and 9 pairs respectively. There were calculated the percentages of words retained immediately, the time of reproduction, the percentages of words retained after 24 hours, and the characters of the mistakes. Normal children reproduced correctly from 75 to 100 per cent. immediately and about 80 per cent. after 24 hours. The average time for the reproduction was 2 sec. for children from 6 to 12 years of age, and 1.2 sec. for those between 12 and 19. There was only about 25 per cent. correct immediate reproduction in the feeble-minded from 6 to 12 years, and only 60 per cent. for those between the ages of 12 and 19; there was a much greater deviation from the normal after 24 hours. The time for reproduction was from 1 to 10 sec. The general paralytics were poor memorizers; only 2 reproduced correctly as much as 75 per cent. immediately, and 19 of the total number averaged only 7 per cent. Fifteen neurasthenics showed normal memory. Although Ranschburg uses his results as indicators for diagnosis and prognosis, this is successful only in certain specially selected cases and in groups, but not for each individual case in any special type of psychosis.

Many tests for the estimation of the general intelligence of abnormal subjects have been devised, and Becker (1) discusses some of these in relation to paranoia and to dementia præcox. The method used by him was a series of questions which called forth observations or statements from the patients. Following are two examples of the type of questions which he used: (1) "Which is heavier, a pound of lead or a pound of feathers?" (2) "Herodotus says: A lioness can bear only one young, because at its birth the cub destroys the womb of the lioness. Why is this statement false?" Results of these tests can be interpreted only in an indirect fashion, and at times no interpretation is possible. Much depends upon the previous education and training of the individual subject and much more upon his coöperation in the test. At the same time such tests can be used only for large groups if they are intended to have any diagnostic value.

Numerous insane patients show no reaction to stimuli, and casual observation would tend to lead to the conclusion that the stimuli were not apprehended. Some of these cases return to a more normal

condition and can recount much that occurred during the period when they did not respond. The stimuli were apprehended, but the reactions were inhibited. That these patients may appreciate stimuli has been shown by the galvanic reactions obtained from some of them by Wells and Forbes (16). One of their cases of catatonic stupor "showed no evidence whatever of consciousness," but reacted galvanically to all forms of stimuli which were applied. One case of senile dementia showed no marked deflections, which would indicate that the stimuli had been appreciated.

Miss Kent's work on the formation of simple habits in cases of dementia præcox (6) is of great interest for it gives a scientific basis for the work of training of these cases which has been lacking. It is well known that many of these patients may be made very useful about an institution, but there are large numbers which are not trained because it appears on the surface that it would take too long a time to get them to acquire proper habits of work. The results of this work, however, show that it is a comparatively easy matter to get almost any case of dementia præcox trained to perform simple series of movements which are useful. Some of these patients who are normally (sic) destructive and filthy may be taught such movements that the old destructiveness and filthy habits are replaced. One of the most important variables in the work was the coöperation of the subjects, but the tests which were used were of such a character that they were not directly appealing to the subjects and they could not be taken as the best possible conditions for the production of coöperation. In general the curves of training resemble those of animals and the method used by the subjects were mostly those of trial and error, although in certain cases the methods were unlike those of animals and those of normal subjects. Continuation of this work, especially in regard to the factors influencing the method of work, are urgently needed, both for psychopathology and for its applications in psychiatry. Here should come tests of the effects of punishments, and of rewards.

REFERENCES

1. BECKER, W. H. Zu den Methoden der Intelligenzprüfung. *Klinik f. psychische u. nervöse Krankh.*, 1910, 5, 1-12.
2. BUSCH, A., and PLAUT, F. Ueber die Einwirkung verlängerter warmer Bäder auf einige körperliche und geistige Funktionen. *Psychol. Arbeiten*, 1910, 5, 505-527.
3. FRANZ, S. I. Touch Sensations in Different Bodily Segments. *Govt. Hosp. for the Insane, Bull. No. 2*, 1910, 60-72.
4. GÖRING, H. Vergleichende Messung der Alkoholwirkung. *Psychol. Arbeiten*, 1911, 6, 261-299.

5. GREGOR, A. *Leitfaden der experimentellen Psychopathologie*. Berlin: S. Karger, 1910. Pp. 222.
6. KENT, G. H. Experiments on Habit Formation in Dementia Præcox. *PSYCHOL. REV.*, 1911, 18, 275-410.
7. KENT, G. H., and ROSANOFF, A. J. A Study of Association in Insanity. *Amer. Jour. of Insan.*, 1910, 67, 37-96; 317-390.
8. KILLAN, K. Zur Untersuchung der Assoziationen bei Maniakalischen. *Klinik f. psychische u. nervöse Krankh.*, 1911, 6, 28-82.
9. KLEPPER, G. Die Unterscheidung von epileptischen und katatonischen Zuständen, speziell aus den Assoziationen. *Klinik f. psychische u. nervöse Krankh.*, 1911, 6, 1-27.
10. NATHAN, E. W. Ueber die sogenannten sinnlosen Reaktionen beim Assoziationsversuch. *Klinik f. psychische u. nervöse Krankh.*, 1910, 5, 76-82.
11. RANSCHBURG, P. Ueber Art und Wert klinischer Gedächtnismessungen bei nervösen und psychischen Krankheiten. III. Die diagnostische und prognostische Verwertbarkeit von Gedächtnismessungen. *Klinik f. psychische u. nervöse Krankh.*, 1910, 5, 89-194.
12. PILLSBURY, W. B., SEASHORE, C. E., and ANGELL, J. R. Report of the Committee of the American Psychological Association on the Standardization of Procedure in Experimental Tests. *PSYCHOL. REV. MONOG.*, No. 53. Pp. 108.
13. SCHNIDTMANN, M. Der Einfluss des Alkohols auf den Ablauf der Vorstellung. *Psychol. Arbeiten*, 1911, 6, 300-338.
14. WALLIN, J. E. W. The New Clinical Psychology and the Psychoclinicist. *Jour. of Educ. Psychol.*, 1911, 2, 121-132; 191-210.
15. WHIPPLE, G. M. *Manual of Mental and Physical Tests*. Baltimore: Warwick and York, 1910. Pp. 534.
16. WELLS, F. L., and FORBES, A. *On Certain Electrical Processes in the Human Body and their Relation to Emotional Reactions*. (Archives of Psychol., No. 16.) New York: The Science Press, 1911. Pp. 39.

CONSCIOUS AND UNCONSCIOUS MENTATION FROM THE PSYCHOANALYTIC VIEWPOINT

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The recent writings of Freud and Jung have a special interest and importance because of their concern with the biological foundations on which the Freudian psychology rests. We are led back to the secure ground of first principles from which we may set out anew to reconstruct with the raw materials of primal, rudimentary psychogenic processes.

Freud rallies attention first of all to the element of disunity which is the central and inseparable factor in the production of the neuroses. It is this element of disaffection in the life of the individual—this inherent revulsion to the existence of things as they actually are

and the substitution of a fanciful portrait of things as they might have been—which constitutes the basis of the neurotic diathesis.

A neurosis presupposes then to a greater or a less degree a withdrawal from the world of reality. It becomes in its essence a sinister evasion of actual issues. Janet recognized this hall-mark of these disorders and aptly characterized it as the loss of the "fonction du réel." It remained to Freud to trace the phenomenon to its genetic source. Through his psychoanalytic researches Freud has brought to light the existence of the essential factor in the causation of this recessive, infolding tendency. He has unearthed a hidden *wherefore* in the situation. Abandoning the prevailing static, mechanically deterministic conception of neurotic disorders, he has removed these processes from the place they had formerly occupied in the sphere of brain disease states and placed them upon a dynamic, conative, biologically purposive footing.

Positing the existence of a primary matrix of unconscious processes as the background of mental life, Freud describes it as consisting throughout of a homogeneous pleasure-pain principle (Lust-Unlustprinzip) or briefly pleasure-principle.¹ It is precisely this "pleasure-principle" belonging to the embryonic psychic organism and actuating it to resist the invasions of outer actuality which represents the point of departure in Freud's psychoanalytic method of interpretation. The mechanism whereby the primitive, elemental organism seeks to preserve its even tenor and to repel the encroachments of reality Freud has called the process of repression (Verdrängungsprozess). This repressive mechanism with its entail of conflicts is the central point in Freud's psychological system.

Upon the assumption of this primary, fundamental, self-sufficing pleasure-principle to which the claims of reality are essentially opposed we come to feel the justification of such conceptions as appear to regard neurotic conditions in the light of a commodity rather than an affliction. Accordingly are made light usages which were dark; such for example as the reference Freud makes to "the choice of a neurosis" or "the retreat into the psychosis" wherein, contrary to the prevailing view, these disorders are represented as rather of the nature of a deliverance than a disease.

Freud regards this pleasure-principle then as primary. It is the elemental psychic principle, constituting, as it were, the menstruum of consciousness. Originally in a state of quiescence its equilibrium

¹ FREUD, S., Formulierungen ueber die zwei Prinzipien des psychischen Geschehens. *Jahrbuch für psychoanalyt. u. psychopathol. Forschungen*, III.

is first disturbed through the functional demands of the organism. "In this case," says Freud, "what was thought (*i. e.*, wished) was simply hallucinated, just as happens later nightly in our dreams." It is only when the required satisfaction is no longer to be had through the process of hallucination, that the psychic organism is forced to yield to the importunities of reality. Thus is thrust in upon the psyche the recognition of a stern outer reality in contradistinction to the benign inner world of fancy. And thus is introduced over against the primal pleasure-principle the principle of reality.

With the entrance of the reality-principle a whole system of adaptations is demanded of the psychic organism—adaptations with which we are familiar in the various activities of consciousness; as for example the adjustments of attention and observation; memory; the purposeful motor innervations; and the higher intellectual processes. Meanwhile there is preserved still the original pleasure-principle which in its antagonism to the reality-principle has established a mode of psychic activity all its own—*das Phantasieren* or phantastic thinking "which begins with the play of children and, continued later as day-dreams, tends to release our contact with objective reality."

The gradual infringement of the elements of the reality-principle upon the pleasure-principle does not take place uniformly throughout. This is notably illustrated in regard to the sexual trends which are tardiest in the process of transformation. So that while the other trends of the ego are responding in a measure to the behests of the reality-principle, the sexual trend, remaining in arrears, continues still under the sway of the primary pleasure-principle. Thus sexuality being in the beginning autoerotic tends to remain in this phase, and, because of the possibilities it is afforded in the direction of autoerotic satisfactions, the sexual trend is in consequence bound up for a proportionately longer time with the pleasure-principle; in which phase indeed it is in many individuals, through the process of repression, delayed throughout life. In consequence of these relations there is established a closer connection between the sexual trend and the sphere of the phantastic on the one hand and the remaining trends of the ego and the conscious activities on the other. "In the sphere of the phantastic, repression remains supreme; so that it comes to pass that images in statu nascendi, if their cognition can give rise to a painful affect, are blocked before they may reach consciousness."

It follows then that an essential part of the psychic disposition to the neurosis lies in the retarded evolution of the sexual trend in its rela-

tion to reality. The pleasure-ego desires merely the immediate satisfaction, however transient and unstable; while the reality-ego seeks the ultimate and permanent good. The former seeks satisfaction in chimerical illusions, the latter in scientific reality. So that education is in truth nothing else than the progressive displacement of the pleasure- by the reality-principle.

As an interruption (through unconscious repression) in the course of readaptation of these two basic trends—the egoistic and libidinous—may occur at any stage of the developmental process, it follows that the character of the resulting neurosis is dependent upon or rather is concomitant with the (unconscious) choice of the phase of retardation and that therefore the character of a neurosis should be studied in relation to the genetic mode in which the above-mentioned developmental arrest takes place.

In the chapter “Ueber die zwei Arten des Denkens”¹ of his “Wandlungen und Symbole der Libido” Jung enters upon a more detailed discussion of the theme unfolded by Freud in his paper on the “Zwei Prinzipien,” namely, that of the essential distinction between the characters of the psychological processes involved in conscious and in unconscious mentation.

Setting out with the empirically manifest phenomenon of symbolization presented in dreams, Jung enters directly *in medias res* with the pertinent psychological inquiry as to “whence it comes that dreams are symbolic.” The more dynamic problem involved in the question “wherefore are dreams symbolic?” is left aside because involving issues no less extensive than the Freudian system of psychology itself.

He first calls attention to the characteristic absence of symbolism in the type of psychic activity we know as conscious thinking, such psychic processes for example as are brought to bear upon the solution of a given problem, and says how upon scrutiny it becomes manifest that this species of mental activity invariably depends upon verbal imagery—that in reality words, or their motor equivalents, are the indispensable medium of thought.

Thinking then, *i. e.*, directed, purposeful thinking, tends to expression, to communicable form. It seeks to address itself outwardly and to conform to reality; in other words it tends to reflect “the succession of objectively real things.” So that biologically stated conscious thinking, like every vital function, is an adaptation to environment.

¹ JUNG, C. G., Wandlungen und Symbole der Libido. *Jahrbuch für psychoanalyt. u. psychopathol. Forschungen*, III.

Jung recalls to mind the biological rudiments of speech which consist "of a system of emotional and imitative sounds" as attested today in the onomatopœic vestiges of current usage. "So that speech is originally and essentially nothing else than a system of signs and symbols which indicate real processes or their reverberation in the human soul" and "howsoever abstract a system of philosophy, it yet represents in regard to end and means nothing else than the most highly elaborated combination of primordial sounds."

Adaptation to the natural sequence of outward phenomena—imitation of and conformity to reality—is characteristic of conscious, directed, verbal thinking. It is the progressive, social, externally assimilable type of psychic activity.

Contrariwise, thinking which is not conscious proceeds aimlessly, intransitively, unproductively. Its flow runs without fixed, predetermined course. It is restricted by no anterior design. It is subjective and automatic, image succeeding image in passive obedience to unpremeditated quests. Unconscious thinking being unpurposive soon leads away from reality into phantasies of past and future. It does not reflect things as they are but decks them out in fanciful array. Thus it represents what is *wished* in contradistinction to what *is*. Because of its likeness to the psychic processes familiar to us in the phantasmagoria of sleep, it is the custom to give to this manner of thinking the name of "dreams."

Comparably with all phenomena in the scale of evolution these two types of psychic activity have their ethnic as well as their individual aspect—conscious thinking being represented in its ethnic phase in the practical system of organized scientific ratiocinations characteristic of our own adult age, while *das Phantasieren* is represented in the phantastic, bizarre, mythological vagaries through which the childhood of the race was wont to seek appeasement. Thus the forward, scientific trend of thought of the present age is the phylogenetic correlate of individual consciousness as presented in the ontogenetic series and correspondingly the illusory, visionary, unreal constructions belonging to the psychic infancy of the race find their genetic analogy in the phantastic, "play" creations characteristic of the psychic life of individual childhood. The analogy here indicated is nothing else than the mental concomitance of the familiar correspondence stage for stage in the historic development of individual characters, as shown in the comparative study of anatomical and embryological evolution. "The myth," says Karl Abraham,¹ "is a

¹ ABRAHAM, KARL. *Traum und Mythos*. 1909.

vestigial remnant of the psychic infancy of the race and the dream is the myth of the individual." But in the phantasies entering into the psychic life of the normal individual of modern times there is lack of conscious indorsement, while the phantasies belonging to an antique cultural period were elevated to a conscious social plane and given the significance of national credence. This is especially illustrated in the phantasies occurring within the sexual sphere. "The symbolism relating to the instrument of coitus was an inexhaustible topic for the fancies of antiquity." So that there arose extensive cults of phallic worshippers. The phallic symbols appeared in countless forms, *e. g.*, as the bird, the fish, the snake, etc., and there existed national theriomorphic representations of the sexual trend, comparable to the theriomorphic symbols of sexuality which the psychoanalyst meets anew in the dreams of the neurotic.

"Viewed from this standpoint, the symbolism which Freud has discovered is seen to be an expression (limited to the dream, the symptom-act and to mental aberrations) of thought processes and psychobiological trends which once exerted a most powerful influence over past cultural epochs."

The type of thinking we call unconscious, uncontrolled, subjective, tending, as it does, to elude the rigid causality of outer reality, is therefore essentially *infantile*, for it belongs to the infancy of the individual and of the race.

"It would seem then that the psyche possesses an historical stratification in which the oldest strata correspond to the unconscious." So that when in later life there occurs an introversion (in the sense of Jung), it consists of a harking back to regressive, reminiscent, infantile material of the individual's (ontogenetic) past, but when a yet further regression takes place (as in the introversion psychosis—skizophrenia) "there are presented outspoken traces of an archaic mentality which under circumstances can extend backward even to the revivification of psychic processes which have now become wholly archaic."

The philosophical discussion the trend of which is here but briefly indicated is the preamble to a detailed analysis of the unconscious material presented in a publication of a Miss Frank Miller under the title "*Quelques faits d'imagination creatrice subconsciente*," in which Jung traces the thread of unconscious symbolism running through them and points out the interesting correlation between the symbolisms in Miss Miller's *poésie* and the symbolism contained in the legends of an early mythology. To follow the author into the inter-

esting inductions he draws from the analysis of Miss Miller's picturesque phantasy would be however to infringe the limits of the present review.

THE PRESENT STATUS OF THE BINET SCALE OF TESTS FOR THE MEASUREMENT OF INTELLIGENCE

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In 1905, Professor Binet published in *l'Année psychologique* (4) a tentative scale of some thirty tests for the measurement of intelligence, these tests being arranged in order of difficulty, beginning with the very simplest kinds of mental adaptation. In *l'Année* for 1908 (5), Binet and Simon published the new and much improved scale which has become the basis of world-wide discussion. The tests of this scale, about fifty in number, had been carefully applied to some two hundred normal Paris children of the poorer quarter, as well as to many defective children. There are from three to eight tests for each year from three to thirteen inclusive, and these groups of tests are given as norms for children of these ages and of corresponding social and industrial rank. The scale appeared almost simultaneously with a law providing for the establishment of special classes for defective children in the schools of France. In a little volume, *Les Enfants Anormaux* (3), Binet and Simon give illustrative directions for the use of the scale in selecting the children to be placed in special classes.

In April, 1911, these authors published (6) a revision of the scale embodying the results of its further application by themselves and others. Five tests are assigned to each year, except for the fourth year. A test was ranked as normal to a given age when 75 per cent. of the children of that age passed it. Above the ten-year level, tests are not given for other levels than 12 years, 15 years, and "adult" (used for "above 15 years").

In *l'Année* for 1911 (2), Binet and Simon present this revised scale with an extended discussion of their experiments and of the criticisms that have been made of the scale, particularly by experimenters in Belgium, England, and America. This article is worthy of note as being Prof. Binet's final word about the scale before his death, which occurred in October, 1911. It seems due to these authors that we sketch here their own very candid review of the "Binet literature":

Decroly and Degand (8) applied the 1908 scale to 43 normal girls and boys in a private school in Brussels. The parents were physicians, lawyers, professors, etc., of very much higher station than the poor Parisian working-people. The classes were small (8-10 pupils), and the instruction highly individualized. Binet and Simon obtained these experimenters' notes of their tests and review them in detail. The Belgians were found to be more indulgent than the French in giving the tests. The Belgian pupils tested in advance in the tests requiring attention, language, and "family lessons," and were behind in the six tests which depend partly on "school exercises." On the average they tested a year and a half in advance of the Paris children, which in Binet's opinion illustrates the difference in intelligence level and in language between children of the poor and of the rich. The Decroly and Degand results do not therefore call for a revision of the scale. Tests in Paris show a decidedly higher level of intelligence ($\frac{3}{4}$ year), in children of a well-to-do quarter over those in a poor quarter, though this difference does not hold for rich and poor taken from the same school.

Miss Katherine Johnston (14) applied the tests to two hundred pupils of the schools in Sheffield, England. Binet and Simon examined the notes of these tests. They find that the tests were applied to some schools of the rich and to others of the extremely poor, and that "these heterogeneous results are confounded in the averages." Irregular variations from the Paris norms are thus to be expected, as found, according as the children were of different social and industrial stations. The count was not made according to the method proper to the scale. Properly counted, and allowing for the admitted fact that in the 1908 scale "the tests for 11 and 12 years are much too severe," Binet and Simon conclude that "the results of Miss Johnston are in perfect accord with ours."

Binet and Simon do not accept the opinion of Whipple (24) and others that the tests are too easy. They consider that Whipple's substitutes for the supposedly "cruel" nonsense statements "cannot be accepted before being tried experimentally. There is nothing to prove that they present a difficulty of comprehension equal to that of our own." The "cruelty" of these sentences does not affect the Paris children unfavorably. They "laugh at them."

Binet and Simon urge as a lesson that they have long been learning and as profoundly important, that intelligence and other mental functions are to be measured by what children do for a *variety* of different tests and not for any one. When correlations of intelligence

with other functions are to be determined, it is these *resultants* that are to be dealt with. "A particular test, isolated from all the rest, is not worth much," and is "subject to errors of all sorts," especially if it is rapid. One could almost say, "the tests matter little if they are only numerous enough." For almost any series of tests the number to which replies are satisfactory "grows regularly enough with age."

As to the general employment of the scale by teachers, these authors call the scale a "*Méthode de luxe*," which like the vernier and microscope secure a fineness of estimate not necessary for most teachers, who are too busy to employ it and do not need to employ it. It is a method which requires "*apprentissage*," to be employed, like the microscope, in "*une étude soigneuse*."

Leaving at this point the review by Binet and Simon, we find that the tests have had much further discussion, of which but partial report can be made in this article.

Whipple includes in his Manual (24) descriptions of the 1905 and 1908 scales with directions for their use, and summarizes the criticisms of Decroly and Degand.

Goddard (9, 10) applied the 1908 scale throughout the New Jersey Training School for feeble-minded children, at Vineland, and finds that results for the 400 children "agree perfectly with long experience in institution life," and a second testing "shows remarkable agreement with the first." Goddard's tests of 1,547 normal children in the first six grades show that the largest number test just to their age, while successively smaller numbers test to higher or lower age levels, these numbers arranging themselves in a normal curve of distribution. (Criticism of this curve, by Terman and by Ayres, will be noted later.) Seventy-eight per cent. of these children test to their age or within a year above or below it. However, certain tests seemed to be wrongly placed, particularly for the latest years; and in view of these and other tests of normal children and of Binet's own revision, Goddard has published (11) a revised scale on the general plan of Binet's revision, but giving tests for 11 years and placing some of the other tests differently. After one year Goddard retested 1,000 of the normal children, and states that the results "show considerable correlation with the earlier test, but with marked and peculiar differences which must be explained." He finds that "feeble-minded children tested from two to seven times show remarkable uniformity in the results, largely regardless of the experience and personnel of the examiner."

Beginning with the autumn of 1909, Huey (13) has used the Binet scale continuously with defectives, at the Illinois state institution at Lincoln and later at the Johns Hopkins Dispensary. The results published for the Lincoln work state that the scale has been indispensable in this actual work with cases, without attempting criticism which the author believes should be based on the examination of normal children. Huey's statement of the scale incorporates the revision of Goddard, and gives the directions most necessary for the employment of the tests.

Wallin (23), as psychologist to the New Jersey State Village for Epileptics, at Skillman, has likewise found the scale a routine necessity in his examinations, but suggests certain revisions. He prints a complete set of detailed directions for giving the 1908 scale.

Kuhlmann (15) has found the scale of great practical service in his work as psychologist to the Minnesota state institution for the feeble-minded, and has used it in the examination of more than 1,300 children. He publishes a condensed and partial translation of the 1908 scale, from the original article of Binet and Simon. He presents the tests and the directions and comments of their authors, with such adaptations as are necessary for American practice.

Bobertag (7) had already reported the Binet-Simon tests in the *Zeitschrift*. In the article here referred to he publishes the results obtained in applying the 1908 tests to 355 normal children of the schools, of the ages 5 to 12 years; and to 80 *Hilfsschule* children of 8-14 years, all in the schools of Breslau. He gives a full and painstaking account of his method of applying each test, with statement of his results, comments, and criticism. He suggests many changes, especially the amelioration, since made by Binet and Simon, of the too severe tests for 11, 12, and 13 years. No one who purposes making a revision of the scale should neglect to review this discussion of the tests by Bobertag.

Lawrence (17) tested 784 public school children, of all the grades from 6 to 13 years, with Binet's *definition* tests (use, superior to use, difference between paper and cloth, etc., meaning of charity, etc., difference between poverty and misery, etc.). The teachers, independently of these tests, sent in estimates of the scholarship of these pupils. In these definition tests, 435 pupils tested to age or not more than a year below; 140 were in advance and 209 were retarded. Seventy-five per cent. of the pupils pointed out by these tests as behind their age are so recognized in the teachers' independent estimate of scholarship, while seventy-nine per cent. of those marked

"good" or "excellent" in scholarship tested to age or above it. Seventy-five per cent. of the school "laggards" "were found by the tests to be mentally retarded one year or more," while the same per cent. of those who are advancing in school more rapidly than the rank and file are found, as above indicated, to be advanced a year or more mentally." The 8-year test was "decidedly too easy" and the "13-year decidedly too hard."

Terman (20), in giving his impressions after testing 90 children and supervising the testing of about 400, says that "by far the most important result was a decided conviction that measuring scales of this general type are feasible, and that when corrected, extended, and multiplied, they will prove of great practical and theoretical value." He finds that "the scale originally offered by Binet is in general far too easy at the lower end, while in the upper ranges it is too difficult. . . . However, in spite of the many imperfections and inadequacies of the revised scale I believe that by its use it is possible for the psychologist to submit, after a 40-minute diagnostication, a more reliable and more enlightening estimate of the child's intelligence than most teachers can offer after a year of daily contact in the school-room." He believes, nevertheless, that "tests of intelligence stand in serious need of further attention before we undertake to determine standards of performance in the different branches of the curriculum."

In a later article Terman and Childs (21) while further eulogizing the plan and usefulness of the scale, urge the need of its revision and extension. Their results, for the tests referred to above, show that on the average their California children of 4-6 years tested to nearly $1\frac{1}{2}$ years above their chronological age, while the children of $11\frac{1}{2}$ to $13\frac{1}{2}$ years tested from one to two years below their chronological age. Goddard's *table* of distribution (10, p. 234) for each age really shows much of this same tendency, particularly for the latest years. Terman considers that Goddard's *curve* of distribution, "lumping all the ages together conceals, of course, the very facts we wish to know. From the above (Goddard's curve) it is seen that the number of younger pupils testing ahead is about balanced by the number of older ones testing behind. What we want to know is how nearly accurate the scale is at every point." Of course it is to be remembered that the 1911 revisions of the scale are in the direction of remedying the errors noted for the later years. Terman and Childs have been trying out some additional tests along with those of Binet and Simon, and plan to publish a revised scale on the basis of their work.

Without having used the scale to any extent with cases, Ayres (1)

presents certain criticisms of it: (1) The tests are largely tests of language ability. (2) Five depend on recent environmental influences. (3) Seven depend on reading and writing. (4) The ability to repeat words and numbers is given too much importance. (5) The same is true of "puzzle tests" and definition of abstract terms. (6) The tests do not sufficiently test native ability, but rather scholastic and other attainments. (7) Due account is not taken of the emotions, habit, etc. He admits that Binet and Simon's "application of tests to a definite, universally understood scale . . . constitutes so important a contribution that its excellence outweighs the shortcomings of the tests themselves." Ayres reaffirms and illustrates Terman's criticism of the fallacy in Goddard's distribution curve. He urges that an improved scale be worked out by coördinating the work of a large number of experimenters, "by some central agency or agencies," to develop a scale that will "really measure native ability."

Kuhlmann in a later article (16), after using the scale in testing 1,300 feeble-minded children, replies *seriatim* to the criticisms of Dr. Ayres, considering most of these to be erroneous and to "come largely from a misunderstanding as to what the different individual tests aim at, and of the mental processes involved in them. The former might have been largely obviated by a more careful consideration of the author's original publications, and the latter by a careful and extensive use of the tests themselves. There is especially a general impression that the authors meant that the results with each individual test will always come out just right, which impression Dr. Ayres seems to share somewhat. If this degree of perfection were attained, only one test of mental age for each chronological age would be necessary, where the authors use from four to eight, and besides point out that this or that individual test often gives wrong results. Probably not a single test in the whole system is free from such objection. In general this article reminds one that it is easy to make criticisms and difficult often to clearly disprove them. But even so, the validity of merely possible objections is not thereby established."

Clara Harrison Town (22), in an especially timely article apropos of the present popularization of the scale, says: "Accustomed to the complicated apparatus of a psychological laboratory, the laity were pleased to find it unnecessary, and overlooked entirely the fact that the psychologist himself was not unnecessary." She quotes Binet's own warnings that "It is not, in spite of appearances, an automatic method, comparable to a scale which, when one stands upon it, throws out a ticket on which one's weight is printed. It is not a

mechanical method, and we predict to the busy physician who wishes to apply it in hospitals, that he will meet with disappointments. The results of our examinations are of no value if they are separated from all commentary; an interpretation is necessary. . . . The idea that a method of examination can be made precise enough to be trusted to every one must be abandoned; all scientific procedure is but an instrument which requires the direction of an intelligent hand. . . . Any one can use it for his personal satisfaction or to obtain an approximation evaluation of the intelligence of a child; but for the result of this method to have a scientific value, it is absolutely necessary that the individual who uses it should have had an apprenticeship in a laboratory of pedagogy or possess a thorough practical knowledge of psychological experimentation."

Dr. Town, who is herself having extensive experience in the use of the scale at the Illinois state institution at Lincoln, reminds us that Dr. Ayres' "whole critique is based on the 1908 series of tests, which has since been revised and greatly altered by Binet himself"; and also that many of his criticisms rest on a misunderstanding of these tests themselves or of the manner in which they are actually given and scored. In general Dr. Town believes that "the result which is threatening is a wholesale use of the scale in an unscientific manner, which will do nothing but postpone the time of its real usefulness—that time when it will be applied by experts along the four practical lines indicated by Binet himself—the grading of normal and backward children in the schools, the diagnosis and classification of abnormal children, the arrangement of school curricula, and in the courts of law."

Meumann (18) makes a condensed but keen analysis of tests of the intelligence, outlining their present status and attempting a constructive interpretation of the principles involved.

Seashore (19) urges briefly that "retardation does not follow a common flat level any more than growth does, nor even nearly so much." We "should not be satisfied with a flat mental age" except for rough classification, as in determining whether a child is feeble-minded. A child may be at the mental age of six in one capacity and twelve in another, and "the important thing to know about the individual is this difference and direction of unsymmetrical development." He thinks the Binet tests should be developed to measure relative rank or age "of more specific capacities and powers, such as reasoning ability, sensory observation, memory, imagination, initiative, emotional control, self-control, etc."

The present writer has elsewhere (12; 13, Chapter VII.) urged such an extension of the principle of the scale to other and more specific mental functions, and believes that this may be a source of most fruitful development in genetic psychology.

In general the scale of Binet and Simon has interested us all in making more methodical study of the intelligence. It has been of immediate and valuable service to psychologists in making examinations of defectives, and it gives promise of being developed to a scale which will render much service in the classification and study of normal pupils. It is hoped that psychologists will prove themselves clinically vigorous enough to use the present scale as a means of growth to the far better ones that Binet himself foresaw.

As for the many non-psychologists who have to make estimates of intelligence, an investigation by Binet himself showed that in making these practical estimates the appeal is regularly to tests, to try-outs of the individual in one or another way. Such persons will at least find the Binet and other series of tests an enrichment of their stock of home-made devices, often economical of time and giving a glimpse, at least, of mental efficiency in more varied and representative directions. Each will make these tests somewhat in his own fashion, inevitably, and the results will by no means match the standardized results. It will be a try-out with a series of test-groups that are progressively more difficult, to see how far the individual can go with them. The more intelligent individuals will be found to go the further, case will be compared with case, and thus if each will give the tests somewhat *uniformly for his own cases*, they may be made the means of building up a more methodical and correct procedure in making estimates of mental efficiency. The tests will not displace the practical judgment, but may be of great assistance in forming and improving it. And even the trained clinical psychologist, with the scale at its best, will doubtless have to "set" it somewhat differently for various social and industrious classes, and will make various allowances for local circumstances, even if not for his own "personal equation."

REFERENCES

1. AYRES, L. P. The Binet-Simon Measuring Scale for Intelligence: Some Criticisms and Suggestions. *Psych. Clinic*, 1911, 5, 187-196.
2. BINET, A. Nouvelles recherches sur la mesure du niveau intellectuel chez les enfants d'école. *L'Année psychol.*, 1911, 17, 145-201.
3. BINET, A. *Les enfants anormaux; guide pour l'admission des enfants anormaux dans les classes de perfectionnement*. Paris: A. Colin, 1907.
4. BINET, A., et SIMON, TH. Du niveau intellectuel des anormaux. *L'Année psychol.*, 1905, 11, 191-244.

5. BINET, A., et SIMON, TH. Le développement de l'intelligence chez les enfants. *L'Année psychol.*, 1908, 14, 1-94.
6. BINET, A., et SIMON, TH. La mesure du développement de l'intelligence chez les jeunes enfants. *Bull. de la soc. libre pour l'étude psych. de l'enfant*, Avril, 1911, 187-248.
7. ROBERTAG, O. Ueber Intelligenzprüfungen (nach der Methode von Binet und Simon). *Zsch. f. angew. Psychol. u. psych. Sammelforschung*, 1911, 5, 105-203.
8. DECROLY, O., et DEGAND, Mlle. J. La mesure de l'intelligence chez des enfants normaux d'après les tests de Mm. Binet et Simon. *Arch. de psychol.*, 1910, 9, 81-108.
9. GODDARD, H. H. Four Hundred Feeble-Minded Children Classified by the Binet Method. *J. of Psycho-Asthenics*, 15.
10. GODDARD, H. H. Two Thousand Normal Children Measured by the Binet Measuring Scale of Intelligence. *Ped. Sem.*, 1911, 18, 232-259.
11. GODDARD, H. H. *The Binet-Simon Measuring Scale for Intelligence*. Revised ed., 1911. Pp. 16. Vineland, N. J.: The Training School.
12. HUEY, E. B. Retardation and the Mental Examination of Retarded Children. *J. of Psycho-Asthenics*, 15.
13. HUEY, E. B. *Backward and Feeble-Minded Children*. Baltimore: Warwick and York, 1912. Pp. 221.
14. JOHNSTON, K. L. Binet's Method for the Measurement of Intelligence.—Some Results. *The Journal of Experimental Pedagogy and Training College Record*, 1911, 1, 24-31.
15. KUHLMANN, F. Binet and Simon's System for Measuring the Intelligence of Children. *J. of Psycho-Asthenics*, 1911, 15, 79-92.
16. KUHLMANN, F. Dr. Ayres' Criticism of the Binet and Simon System for Measuring the Intelligence of Children—a Reply. *J. of Psycho-Asthenics*, 1911, 16, 58-67.
17. LAWRENCE, ISABEL. A Study of the Binet Definition Tests. *Psych. Clinic*, 1911, 5, 207-216.
18. MEUMANN, E. Der Gegenwärtige Stand der Methodik der Intelligenzprüfungen (mit besonderer Rücksicht auf der Kinderpsychologie). *Zsch. f. exper. Pädagogik*, 1910, pp. 68-79.
19. SEASHORE, C. E. The Binet-Simon Tests. *J. of Ed. Psych.*, 1912, 3, 50.
20. TERMAN, L. M. The Binet-Simon Scale for Measuring Intelligence; Impressions Gained by its Application. *Psych. Clinic*, 1911, 5, 239-244.
21. TERMAN, L. M., and CHILDS, H. G. A Tentative Revision and Extension of the Binet-Simon Measuring Scale of Intelligence. Part I. *J. of Ed. Psych.*, 1912, 3, 61-74.
22. TOWN, CLARA H. The Binet-Simon Scale and the Psychologist. *Psych. Clinic*, 1912, 5, 239-244.
23. WALLIN, J. E. W. A Practical Guide for the Administration of the Binet-Simon Scale for Measuring Intelligence. *Psych. Clinic*, 1911, 5, 217-238.
24. WHIPPLE, G. M. *Manual of Mental and Physical Tests*, pp. 473-517. Baltimore: Warwick and York, 1910.

SPECIAL REVIEWS

DEMENTIA PRÆCOX

Dementia Præcox oder Gruppe der Schizophrenien. BLEULER. Leipzig und Wien: Franz Deuticke, 1911.

Of a comprehensive work on psychiatry, the "Handbuch der Psychiatrie," edited by Aschaffenburg, there have been published thus far two parts, one on manic-depressive insanity by Stransky, and one on dementia præcox by Bleuler. The latter work, a book of some 400 pages, takes up the study of this important disorder in a very comprehensive manner. The purpose of the present writer is to give here a brief review, not of the clinical-nosological part of the work, but of the psychological portion entirely. It is, however, necessary to state that Bleuler comprises in his book a great many cases which others would not include in the group or groups of dementia præcox, so that his analysis refers in reality a great deal to the symptomatology of the functional psychoses.

What characterizes the manifestations of dementia præcox are: a more or less marked disorder of the train of thought, sometimes spoken of as scattering of ideation with bizarre turns, fragmentary thoughts, and so on; frequently a lack of harmony of affect and intellectual content; an absence of correlation of mental contents; various interferences with the train of thought in the form of sudden stoppage of a topical nature, or of diffuse inhibition of mental operations [termed blocking of thought (*Sperrung*)]; the frequent appearance of impulses opposite to what the circumstances would demand, or a warding off of all interferences, diffuse, or under certain situations only (negativism); a general tendency to shut out the world of reality (by Bleuler called "autism"); an affective deterioration; and finally such symptoms as hallucinations, delusions, impulsive acts, peculiar mannerisms, and the like.

Bleuler gives an excellent and extensive description of all these symptoms, and also makes an attempt at a psychological explanation which he admits frankly to be tentative, yet which to the psychiatrist is of great value and represents a splendid attempt at clarifying the mechanisms in a disorder which, at best, is complex and difficult to understand. Bleuler has proposed to give to dementia præcox the

name schizophrenia, because a great deal in the symptomatology refers to a tearing asunder of normal mental cohesions. This he proceeds to analyze more in detail. He assumes, first of all, a primary diffuse "association disorder," which he seems to consider not further reducible, and which he attributes, therefore, directly to a physical disease process. This he admits to be problematical. The association disorder, therefore, represents an ultimate defect, very much in the same way, I take it, as the loss of memory represents an ultimate defect in the organic disorders. He refrains, however, from any correlation with anatomical changes. This primary disease process he attempts to support by some other phenomena, notably physical ones, an attempt which is not especially convincing. The primary association disorder, he conceives as a sort of leveling down of normal associative affinities, which leads in itself to elisions and fragmentary mental products but which, above all, forms the fundamental defect upon which develop the other symptoms. This is possible, particularly, owing to the fact that the affects can then exert a much greater influence than normally; in other words, the symptomatology is largely determined by the affectivity, through mechanisms, some of which Freud has taught. Bleuler therefore shows how affective complexes are at the bottom of a great deal in the manifestations of dementia præcox, and how, in addition to primary splitting, there is an extensive secondary splitting produced by the affects; thus he admits the great importance of psychogenesis in dementia præcox, but he confines this action to the secondary symptoms, which represent more or less plain evasions of difficult situations.

The psychology of dementia præcox cannot be understood unless we accept the importance of unconscious trains of thought which follow in many ways the same laws as conscious thinking, and which manifest themselves through Freudian mechanisms. But this influence is a much more extensive one in dementia præcox than in the normal, or in hysteria, for example. The affects produce much more profound dissociations. The influence of reality is much more excluded. We might almost say, the individual manifestations stand in the mind much more like foreign bodies. We have attempted to account for this largely by the shut-in tendencies, which probably must be referred to more fundamental defects in make-up and which manifest themselves more or less early in tendencies to live in a world apart where the correcting influence of reality is more or less excluded. Bleuler attributes all this, the shut-in tendencies included, to his primary association disorder, which, as we have said, in turn, gives

the affects greater sway. Whereas the logical train of thought follows paths established by experience, the affects direct the train of thought according to desires and aversions. In the normal they are responsible only for the general direction of action, and the logical operations are not falsified except in realms where subjectivity is generally permitted to guide us, as in matters of taste, for example. In dementia praecox the affects disturb even otherwise well-grounded associations. Through this greater influence of the affects, the possibility of a more or less complete exclusion of all that does not harmonize with the affective complexes is also possible, so that these assume more and more a certain autonomy, and can manifest themselves without there being any attempt at correlation.

The remarkable affective deterioration is, according to Bleuler, a secondary phenomenon. He justly points to the fact that normal affects can be produced in dementia praecox patients when they are forced to think of their complexes; he shows how in the beginning of the disorder, the affective deterioration is by no means general but refers to certain topics only (affective complexes), and also that cases with apparent affective deterioration sometimes get well. Hence he assumes not a loss, but a repression of affects. These repressed affects manifest themselves in various ways but also inhibit other affects. This is not unlike what we see in normal individuals who are preoccupied with an affectful experience. In addition to this, the autism and the splitting off of affective complexes have their share in the production of the general indifference.

The normal individual includes in his logical operations more or less everything in his past and present experience, which has a bearing, irrespective of its emotional value; the fundamental schizophrenic disorder on the other hand makes the exclusion of external and internal facts possible, and permits the natural tendency to live in fancies to flourish. Bleuler speaks of this as autistic thinking, and of the general tendency to turn away from reality as autism, making it dependent, therefore, upon his primary association disorder. In attempting to make negativism comprehensible, he points in the first place, to the fact that every impulse is closely associated with its opposite, which he looks upon as a sort of protective mechanism and which he designates ambivalence. This assumes pathological proportions in dementia praecox. But this negativism, of course, is also closely related to autism and further accentuated by it, and other factors also contribute to the prominence which this symptom may attain in dementia praecox, such as a certain sensitiveness and an instinctive desire on the part of the patient to protect himself against

actual or possible irritation of "mental wounds," also an opposition to the more or less hostile attitude of the environment, and very likely, not infrequently, a certain difficulty in thinking and acting.

What we term "blocking" is undoubtedly an exaggeration of that which we normally know as repression, and whenever the symptom was analyzed in cases, it could be traced to the influences of complexes. But Bleuler also refers some general reductions of activity, or some more or less pronounced conditions of inhibition of mental operations to the same principle, because this can be seen at times to develop out of more topical blocking; and he likens this to the so-called emotive stupor seen in normal persons; at the same time the tendency to stereotypy of impulses, and the tendency to generalization seen in dementia præcox, as well as the lack of interest and the difficulty in mental operations, may also contribute to the full development of this blocking. Stupor or stupor-like reductions may also be due to hallucinations and other causes, *e. g.*, a certain cerebral torpor conceived by Bleuler as the direct outcome of the disease process. Catalepsy, though difficult to explain, seems at least in part accounted for by a certain dearth of ideas which, in other conditions, is also found to be associated with it.

Many symptoms, such as delusion, hallucinations, and odd acts, are direct intrusions into consciousness, of subconscious complexes, and represent wishes and fears, often symbolized and only comprehensible when the possibility of symbolism is fully recognized. They are often difficult to analyze because they may be distorted by substitutions or gradual metamorphoses. The peculiar disharmony between affects and ideas is certainly often explained by the fact that, just as in the case of dreams, the ideas stand for something else than what they appear to represent.

An important part of the work is to be found in the fact that Bleuler clearly demarcates the disorders found in dementia præcox from those of the organic mental disorders, and justly shows that an elementary memory and apprehension defect, as well as primary motility symptoms, are foreign to the symptomatology of dementia præcox.

Such a short review cannot do justice to a work which contains so much that is valuable. A thorough study of it will repay every one interested in normal and abnormal psychology and in the analysis of the most complex pathological phenomena, in which constant reference is made to normal processes.

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AUGUST HOCH

THE PSYCHOLOGICAL BULLETIN

GENERAL REVIEWS AND SUMMARIES

CUTANEOUS, KINÆSTHETIC AND MISCELLANEOUS SENSES

BY ROSWELL P. ANGIER

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Cutaneous Sensation.—So far as the literature of the year 1911 has been accessible to the reviewer, perhaps the most significant piece of work on cutaneous sensation is that by Kiesow (10). It concerns the observation of E. H. Weber (published in 1846) that a given object (German *Thaler*) felt, on the skin of the forehead, when cooled, heavier than when warmed. The problem rouses a somewhat livelier interest because of the observations of Szabadföldi (1865), apparently contradictory to those of Weber. Szabadföldi found that, of two discs of hard wood, one warmed to 50° or more and the other of indifferent temperature, the warmer disc felt the heavier, even though actually smaller than the other, but that the character of the results was somewhat dependent on the diameter, thickness and absolute weight of the discs utilized.

Kiesow, in his own tests, verifies Weber's results, even if the warmer object has a temperature as high as 50°, provided that the other gives a manifest sensation of cold. Szabadföldi is, however, confirmed when a disc of 50° is compared with one of indifferent or slightly warm temperature. Diameter, thickness, or absolute weight have, furthermore, no special influence on the result. Nor have such different substances as copper, silver and nickel coins, cork, gypsum, cardboard, paper, etc. It was found, finally, that a cold stimulus as such may give an impression of weight (évaporating ether from a saturated disc of filter-paper as compared with a similar disc,

not etherized and tactually unfelt). The best results, as in the case of the earlier experimenters, were obtained on the forehead. Other facts observed by Kiesow were that the cooler object appears to have the greater area and to lie deeper in the skin than the warmer.

As for explanation of the main phenomenon, Kiesow offers the following (p. 85): Es "kann als sicher gelten, dass die Erregung der Tastorgane eine Funktion des an ihrem Orte herrschenden Druckgefälles ist, und es kann weiter als wahrscheinlich angenommen werden, dass hierbei Konzentrationsänderungen der Zellflüssigkeit auftreten, die direkte Erregung der Tastorgane durch Änderungen des osmotischen Drucks verursacht wird, im letzten Grunde also eine chemische ist. Dies vorausgesetzt, . . . dürfte die Annahme berechtigt sein, dass auch der Kältereiz im Innern der Haut Veränderungen hervorruft, die den durch mechanische Einwirkungen erzeugten Deformationen analog sind. Durch diese würde unter den genannten Voraussetzungen dann ebenfalls eine Störung des chemischen Gleichgewichts herbeigeführt werden, die ihrerseits wiederum auf die Enden der Tastnerven einwirken muss. . . . Dass bei Einwirkung von Kältereizen Kontraktionen der einzelnen Gewebsteile auftreten müssen, ist eine Tatsache, die ausser allem Zweifel steht. . . . Dass solche Kontraktionsvorgänge weiter Verschiebungen der Gewebsflüssigkeit und demzufolge auch wohl Konzentrationsänderungen der Zellflüssigkeit nach sich ziehen müssen, dürfte somit nur eine berechtigte Folgerung sein." The warmer object, furthermore, feels lighter than it normally would feel because the heat, causing expansion of the tissue or of the cell fluids, exerts a stimulus on the touch organs in a direction contrary to that given by its weight, so that the latter cannot have the full effect that it would, acting alone, possess. If the object is further warmed, the expansion-effect outbalances the antagonistic pressure-effect and one observes Szabadföldi's phenomenon—the warm object appears heavier than one of indifferent temperature—since a pressure organ mediates the same kind of sensation whatever the direction in which the stimulus acts. The forehead, finally, is the most favorable field for tests, since the sensitivity to pressure is great, the pressure spots thicker together and the skin thin. Other parts of the body with these characteristics also give the phenomena, although less pronounced.

v. Frey (7) gives simply a preliminary report of experiments made with H. D. Cook on the influence of different pressure-stimuli on one another. So far as tactual *sensation* is concerned, it was found

that the stimulation of two points on the skin yields mutual facilitation (two simultaneous impressions, either alone subliminal, rising above the threshold) and that this is in dependence on their distance apart and their relative intensity. Of three equally intense stimulations, for instance, two near together are subjectively more intense than a third more distant. v. Frey's results apparently contradict those of Heymans, who found that tactual stimuli have, in proportion to their proximity, a mutually inhibitory effect. One awaits with interest, therefore, the full report of v. Frey's work.

Siebrand (18) concerns himself with differential sensitivity to cold stimuli. The areas tested were on the ball of the thumb and the volar forearm. The results were as follows: (1) Stimulation of a given cold spot at various stimulus temperatures, with a constant area of contact, showed marked individual differences,—.4° C. for one subject, 3° C. for another; (2) increasing the area of stimulation, although on but a single cold-spot, increased discriminability; (3) increase in the number of cold-spots stimulated, with constant temperature and area, increased felt intensity of cold, the same results obtaining, too, if the area was enlarged but the number of spots stimulated constant; (4) a single cold-spot, if thickly set with others, gave a lower threshold than one more isolated.

Barnholt and Bentley's experiments (4) concern the problem of the effect of areal or numerical increase of thermal stimulus on sensory intensity. On chosen surfaces (palm, volar forearm) 70 per cent. of the observations of three subjects gave intenser cold with the larger area. Less sensitive areas were then compared with more sensitive, the smallest stimulus area being used for the latter and all other areas for the former. A large less sensitive area may thus report intensities equal to a small area of greater sensitivity. Tests of another sort showed, however, that the intensity of a temperature sensation is determined by the most sensitive area in the excited complex. The high intensity of a large area is doubtless due in part at least to the better conditions afforded by a stimulus of great area for conduction to the true temperature organs. These results may be profitably compared with those of Siebrand.

The clinical interest in tactual sensation is represented by the articles of Baglioni and Pilotti (2), Minor (13), and Maloney and Kennedy (12). The first of these, on the effects of stovaine injections, duplicates an article in German, by the same authors, and already reviewed in the *BULLETIN* last year (p. 152). Minor offers a convenient thermoæsthesiometer for psychiatric-clinical use by means

of which the temperature difference between two stimulus tubes, filled with water, may be quickly reduced. Maloney and Kennedy tested the pressure sense about the face in a number of cases with well-defined lesions of the fifth, seventh and twelfth cranial nerves, in an attempt to determine the functional distribution of these nerves. It is impossible to enter into the details of their discussion. Of general interest to psychologists is their statement that after removal of the Gasserian ganglion (origin of the fifth nerve), the areas of the face anæsthetic to light touch are identical with those lacking deep sensibility. It will be remembered that Head and Sherren found, for lesions to the radial nerve, that the former extended beyond the latter. Maloney and Kennedy believe the *apparent* greater circumscription of the areas of loss of deep sensibility, in their tests on the face, to be due to the tension effect of the heavier stimulus on the normal tissue bordering the anæsthetic area. This can, in the reviewer's opinion, scarcely explain the findings of Head and Sherren, since the area of loss for light touch often went far beyond that for pressure. Certain of the authors' further conclusions are (1) that the fifth nerve is the essential path for pressure-touch impressions in the face; (2) that the seventh nerve in the Fallopian canal is associated with fibers mediating pressure-pain from the skin muscles and bones of the facial muscular apparatus up to pressure of about four kilos (low threshold mechanism); (3) that the peripheral twelfth subserves no sensory function for the tongue; and (4) that the sympathetic mediates a crude pressure-pain sensibility for pressure upwards of four kilos (high threshold mechanism), a mechanism less sensitive, therefore, than that of the fifth or seventh nerves.

The interest of the work of Willis and Urban (22) with weights lies in the sphere of psychophysical methods and need not here be considered. Their article is supplementary to a previous publication.¹ Ziehen (23) argues for the method of right and wrong cases in investigations of the kinæsthetic sense, especially in its development and in that of kinæsthetic space in children. Incidentally he states his belief that what one really investigates is not kinæsthetic sensations, but a fusion of mechanical stimulations in the joint, muscles and tendons felt as an indeed very indefinite *Berührungsempfindung*, with ideas of movement, the latter being normally visual but, for the blind, tactual. What is really investigated is, therefore, ideas of movement *evoked* by kinæsthetic sensations.

¹ Urban, F. M., "Die psychophysischen Massmethoden als Grundlagen empirischer Messungen," *Arch. f. d. ges. Psychol.*, 1909, 15, 264-267.

Kunz (11) returns to a polemic (Cf. *Zsch. f. päd. Psychol.*, 1909, Vol. 9) on the nature of distance "sensation" or "feeling" as distinct from orientation, maintaining his previous conclusions, that this sense, localized on the skin, is indeed of tactual and not auditory origin.

Organic and Other Sensations.—Physiologists and clinicians return again and again to the problem of the sensibility of the inner organs. Neumann (15), in a series of articles scattered through the volume, gives a comprehensive historical review of work up to 1910. In another series (16) he reports certain experiments on the frog. Uncovering and stimulating the various inner organs (pinching with forceps, faradic stimulation, hot glass rod, etc.) he secured from most of them a peculiar reaction—a stretching and backward bending of the back, slow and quite distinct from the jerky defense reactions. In other experiments, conclusions concerning the functional distributions of nerves were reached.

Hertz (9), in three lectures, partly historical and critical, partly based on his own experiments on direct stimulation of the alimentary canal of human beings and on inferences from the symptomatic pains of typical alimentary diseases, gives, among manifold other conclusions, the following: (1) "The mucous membrane of the alimentary canal from the upper end of the œsophagus to the junction of the rectum with the anal canal is insensitive to tactile stimulation." (2) "The mucous membrane of the œsophagus and the anal canal is sensitive to thermal stimulation, but that of the stomach and intestines is insensitive. (3) The only immediate cause of true visceral pain is tension; this is exerted on the muscular coat of hollow organs and on the fibrous capsule of solid organs. . . . Pain in diseases of the alimentary canal is most frequently true visceral pain; it is sometimes due to spread of the disease to surrounding sensitive structures or to tension exerted on the peritoneal connexions" (p. 1193). Mitchell (14) concludes from a series of correlations between accounts of pains of his patients before abdominal operations and his findings on operating that the parietal peritoneum, and consequently the organs involved with it, is sensitive to pain, but that the visceral peritoneum with its abdominal organs supplied only by the sympathetic system is not sensitive. This result supports in general the views of Lennander (1901). Dana (6) gives an entertaining discussion of the possible correlations between types of pains and types of psychoneuroses.

Two papers, one by Alexander (1), the other by Bárány (3), on

the functions of the inner ear deserve passing mention. Alexander's is a succinct and comprehensive review of the facts and theories concerning the functions of the vestibular apparatus. Bárány's is a brief summary of his theoretical position discussed in extenso in another article.¹

Oppenheim (17) describes and discusses cases met with in his practice of permanent dizziness not assignable to objective causes. It differs from either cerebellar or vestibular dizziness and always begins with a marked attack, resists treatment, especially psychotherapeutic, and is probably not in the psychiatric sense a mental trouble, but is rather dependent on some still undiscovered irritation in the central nervous system. Friedländer (8) reports a case, however, manifestly hysteric in origin, but showing the same stubborn permanent dizziness already described by Oppenheim. Cruchet and Moulinier (5) gives merely a brief description of symptoms of aviator sickness.

Finally, Sternberg (19, 20), recurs anew in two articles to his already much exploited doctrines of the nature and functions of appetite. A third article (21) gives another of his remarkable discussions on *tickling feelings*. He attempts to define, chiefly on the basis of philological usage, the meaning and function of tickling in general and in particular. When philological analysis has done its best "erst dann," he thinks, "wird man zur Feststellung des Begriffes der Kitzelgefühle und zur Einsicht in das Wesen des Kitzels gelangen" (p. 109). Bis dahin—Geduld!

REFERENCES

1. ALEXANDER, G. Die Funktionen des Vestibularapparates. *Ber. IV. Kongress f. exper. Psychol.*, 1911, 74-94.
2. BAGLIONI, S., & PILOTTI, G. Recherches dans la rachistovainisation humaine. *Arch. ital. de biol.*, 1911, 55, 82-90.
3. BÁRÁNY, K. Zur Theorie des Bogengangapparates. *Ber. IV. Kongress f. exper. Psychol.*, 1911, 250-252.
4. BARNHOLT, S. E., & BENTLEY, M. Thermal intensity and the area of stimulus. *Amer. J. of Psychol.*, 1911, 22, 325-332.
5. CRUCHET, R., & MOULINIER, —. Le mal des aviateurs. *C. r. acad. d. sci.*, 1911, 152, 1114-1115.
6. DANA, C. L. The interpretation of pain and the dysesthesias. *J. of the Amer. Med. Assoc.*, 1911, 56, 787-791.
7. FREY, M. VON. Die Einwirkung einfacher Druckempfindungen aufeinander. *Ber. IV. Kongress f. exper. Psychol.*, 1911, 233-236.
8. FRIEDLÄNDER, A. Bemerkungen zu Oppenheim's Arbeit: "Ueber Dauerschwindel." *Neur. Cenibl.*, 1911, 30, 1162-1164.

¹ *Zsch. f. Sinnesphysiol.*, 1910, 45, 63-68.

9. HERTZ, A. F. The sensibility of the alimentary canal in health and disease. *Lancet*, 1911, 180, 1051-1056; 1119-1124; 1187-1193.
10. KIESOW, F. Ueber die Versuche von E. H. Weber und M. Szabadföldi, nach welchen einer Hautstelle aufliegende Gegenstände von gleicher Grösse nicht gleich schwer empfunden werden, wenn ihre Temperaturen gewisse Unterschiede aufweisen. Nach einer zum Teil von Dr. Leopold Chinaglia ausgeführten Untersuchung. *Arch. f. d. ges. Psychol.*, 1911, 22, 50-104.
11. KUNZ, M. Zum "Ferngefühl" als Hautsinn. *Zsch. f. päd. Psychol.*, 1911, 12, 621-634.
12. MALONEY, W. J., & KENNEDY, R. F. The sense of pressure in the face, eye and tongue. *Brain*, 1911, 34, 1-28.
13. MINOR, L. Ein neuer Thermoästhesiometer mit Mischvorrichtung. *Neur. Centbl.*, 1911, 30, 1037-1041.
14. MITCHELL, J. F. Sensibility of the peritoneum and abdominal viscera. *J. of the Amer. Med. Assoc.*, 1911, 57, 709-712.
15. NEUMANN, A. Ueber die Sensibilität der inneren Organe. *Centbl. f. d. Grenzgeb. d. Med. u. Chir.*, 1910, 13, 1ff.
16. NEUMANN, A. Zur Frage der Sensibilität der inneren Organe. *Zentbl. f. Physiol.*, 1911, 24, 1213-1217; 1217-1219; 25, 53-56.
17. OPPENHEIM, H. Ueber Dauerschwindel (vertigo permanens). *Monat. f. Psychiat. u. Neur.*, 1911, 29, 275-293; *Neur. Centbl.*, 1911, 30, 290-296.
18. SIEBRAND, —. Untersuchungen über den Kältesinn. *Zsch. f. Sinnesphysiol.*, 1911, 45, 204-216.
19. STERNBERG, W. Das Appetitproblem in der Physiologie und in der Psychologie. *Zsch. f. Psychol.*, 1911, 59, 91-112.
20. STERNBERG, W. Der Appetit in der exakten Medizin. *Zsch. f. Sinnesphysiol.*, 1911, 45, 433-459.
21. STERNBERG, W. Die Physiologie der Kitzelgefühle. *Zsch. f. Psychol.*, 1911, 60, 73-109.
22. WILLIS, C. A., & URBAN, F. M. Ein Beitrag zur Kenntnis der psychometrischen Funktionen im Gebiete der Gewichtsempfindungen. *Arch. f. d. ges. Psychol.*, 1911, 22, 40-46.
23. ZIEHEN, T. Die Methoden zur Prüfung der Kinaesthetischen Empfindungen. *Zsch. f. Päd. Psychol.*, 1911, 12, 216-225.

SYNÆSTHESIA

BY PROFESSOR A. H. PIERCE

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A full and detailed account of the case of colored gustation reported in outline last year¹ is now available (1). It is abundantly shown that the subject—a young man of college age—has a defective sense of taste. Tastes seem to be recognized largely by tactual accompaniments and discriminated by their "feel" and by the color induced. Substances as different as cayenne pepper and quinine

¹ Cf. PSYCHOLOGICAL BULLETIN, 1911, 8, 158.

(both in solutions) are indistinguishable, both producing the same "feel" on the tongue and both inducing the same color—a dull orange-red. Furthermore, the behavior of the induced color is at times dependent upon the temperature of the solution. Plugging the nostrils reduced the intensity and persistence of the taste-colors. A reasonably definite correlation between taste-color tones and taste qualities was made out.

The genuineness of the synæsthesia and the sensational (rather than imaginal) value of the taste-colors is attested by (1) the constancy of the correlation just referred to, (2) the persistence of the induced color (sometimes for more than ten minutes), (3) its localization (in the mouth), (4) its independence of the subject's volition, and (5) the feelings of tension and dizziness when simultaneously experiencing a taste-color and fixating a colored surface.

The case of colored audition reported by Myers (3) is peculiar first in the fact that colors are induced only by tones,—timbre, intensity, and the pitch of the foregoing tone being conjointly influential. Tones below 600 vibrations per second give brown and orange colors; those between 600 and 12,000 give blue, changing to green; and those above 12,000 give a colorless gray. The subject is a man of thirty, unmusical.

This case stands in marked contrast with that summarized above, the induced color being neither sensory nor imaginal in character. The subject "insisted that his imagery was verbal or more often that his thoughts were entirely imageless." As a believer in "imageless thought" Myers finds no difficulties here.

The subject himself "regards his synæsthesia as the result of some 'sympathy' existing in him between auditory and visual experiences." Myers interprets this as analogous to the tendencies by which we speak of tones as "heavy, rounded or dull"; and in the fact that synæsthesias are more common among children he sees grounds for the view that "their origin may perhaps be ascribed to the persistence of a primitive stage in the differentiation and elaboration of sensations and in the development of their functional interrelation." Strong tendencies to association, combined with the "sympathy" referred to, would then be favorable to the formation of synæsthesias.

The paper by Medeiros-e-Albuquerque (2) is weak and unconvincing, with a quite unjustified title. The author finds that those who think only in Portuguese associate the *u* of that language with the color black. This arises from the fact that *u* is the accented vowel of

the majority of Portuguese words signifying black objects or ideas relating to black. This association is, admittedly, no true synæsthesia, but the author believes that it is only a matter of degree between these logical and spontaneous associations and genuine cases of colored audition.

REFERENCES

- DOWNNEY, JUNE E. A Case of Colored Gustation. *Amer. J. of Psychol.*, 1911, 22, 528-539.
- MEDEIROS-E-ALBUQUERQUE. Sur un phénomène de synopsie présenté par des millions de sujets. *J. de psychol. norm. et path.*, 1911, 8, 147-151.
- MYERS, C. S. A Case of Synæsthesia. *Brit. J. of Psychol.*, 1911, 4, 228-238.

AFFECTIVE PHENOMENA — EXPERIMENTAL

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Three articles have appeared from the Leipzig laboratory during the year. Drożyński (2) objects to the use of gustatory and olfactory stimuli in the study of organic reactions with feelings, because of the disturbance of breathing that may be involved. He uses rhythmical auditory stimuli, and finds that when given at different rates and in various groupings, they are accompanied by characteristic feelings in each subject. He records the chest breathing, and curves from a sphygmograph and a water plethysmograph. Each experiment began with a normal record, then the stimulus was given, and this was followed by a contrast stimulus; lastly, another normal was taken. The length and depth of breathing were measured (no time line was recorded), and the relation of length of inspiration to length of expiration was determined. The length and height of the pulse-beats were also measured. Tabular summaries are given of the number of times the author finds each quantity to have been increased or decreased during a reaction period with each type of feeling. The feeling state accompanying a given rhythm is always complex, but the result is referred to that dimension which seemed to be dominant. Only a few disconnected extracts from normal and reaction periods are reproduced from the records.

The author states that excitement gives increase in the rate and depth of breathing, in the inspiration-expiration ratio, and in the rate and size of pulse. There are undulations in the arm volume. In so far as the effect is quieting, it causes decrease in rate and depth of

breathing, in the inspiration-expiration ratio, and in the pulse rate and size. The arm volume shows a tendency to rise with respiratory waves. Agreeableness shows an increase in rate of breathing, the inspiration-expiration ratio, and size of pulse; and a decrease in depth of breathing and pulse rate. There is a tendency for the volume to rise with respiratory and other waves. Disagreeableness is accompanied by increase in rate of breathing and pulse, decrease in depth of breathing and height of pulse. In the arm volume there are falls and undulations. Strain causes generally faster and shallower breathing, faster and stronger pulse, and a rise of arm volume with respiratory waves. Relaxation shows slower and deeper breathing, slower and stronger pulse. When excitement is combined with the others, it seems to dominate in the organic expression. Each feeling has its characteristic expression-valence. There are many exceptions to all correlations. A given feeling may show itself in only part of the expressive reactions at once. The author considers the breathing the most reliable index of feeling.

One criticism especially must be passed upon this and many other works of the kind. It is necessary that sufficient data be reproduced in some complete and accurate form that the reader may judge for himself whether physiological matters have been adequately considered, whether the reactions are significant and whether he agrees with the author's interpretation. Otherwise one need not place much confidence in the conclusions. This article does not fulfill such requirements.

The second article from Leipzig is by Rehwoldt (5). He recorded curves from five pneumographs, two on the chest and three on the abdomen, and from a sphygmograph. After the apparatus was adjusted, the subject gave a signal when he had succeeded in placing himself in an indifferent condition and a normal record was taken. The subject then aroused an affective state by reproduction of an experience or idea. He gave a signal when he had succeeded in this and a reaction record was taken. From two to six affective states were thus studied in an hour and finally another normal curve, modified perhaps by resonance of the preceding feelings, was taken. The subject's report was recorded after each normal or reaction curve.

For each normal record the average length of breath and length of pulse and the amplitude of movement in each respiratory curve were determined in millimeters and tabulated. The inspiration-expiration ratio is also given. For each reaction record the inspiration-expiration ratio and the ratio of the other quantities to the similar measurements in the corresponding normal record are given.

The feelings obtained were always complex. The author found a clear-cut expression for quiet, excitement, and strain only. With quieting conditions, the inspiration-expiration ratio was less than one and the breathing tended to be abdominal. Excitement gave an inspiration-expiration ratio which was greater than one in the chest and tended to be greater in the chest than in the abdomen. There was a dominance of chest breathing and the rate of breathing was sometimes increased, sometimes decreased. Strain showed an inspiration-expiration ratio which averaged about one and the rate of breathing was increased. There was no certain correlation between agreeableness and decreased heart rate.

Stefănescu-Goangă (6) studied the affective states caused by colors, and the organic expression of these affective states. Light from a projection lantern was passed through colored gelatine and thrown upon a white screen in a darkened room. In the greater part of the experiments a single, isolated stimulus was used. The subject was asked to describe the affective state, and was helped by questions from the experimenter. In part, the method of paired comparison, both successive and simultaneous, was used. The chest and abdominal breathing, and a sphygmographic curve were recorded. A normal period, a stimulus period, and a recovery period constituted a test.

The length of breaths, the depth of chest and abdominal breathing, the inspiration-expiration ratio, the depth at the middle of inspiration and that at the middle of expiration compared with the total depth, and the pulse length were determined by measuring the curves in millimeters. Tabular summaries give the number of cases and direction of change which the author finds in each of these quantities when the reaction period is compared with the normal period.

The colors are found to cause strong affective states which must be classified first of all under the heads of excitement and rest or depression. Excitement is the most constant and dominant feeling with red, orange, yellow and purple; rest or depression is foremost with green, blue, indigo and violet. Combinations with agreeableness or disagreeableness are variable. Excitement and rest are not simple feeling qualities, but rather feeling dimensions, each one of manifold varieties.

The author decides that the organic expressions indicated by the results are as follows: Excitement causes faster breathing and increased depth of breathing especially in the chest. The inspiration-expiration ratio, the pulse rate and size of pulse are increased. The

form of the curve shows a forceful beginning of inspiration. Rest or depression gives opposite reactions. Agreeableness shows a tendency toward decreased chest and increased abdominal breathing. The length and size of pulse are increased. With disagreeableness the opposite pulse reactions are found. In the breathing changes, agreeableness approaches rest, disagreeableness approaches excitement.

As nearly as one can judge from measurement of the curves published, it seems to me that the majority show no definite reaction in pulse rate, and No. 4 gives a result opposite to that assigned to it. It is noticeable that these articles from Leipzig all insist that we must find a basis in organic expression for the tridimensional theory of feeling; but they differ as to the details of such reactions, and differ markedly from the statements of others who have tried to defend the same theory in the past.

Leschke (3) gives a very interesting and useful critical discussion of work that has been done on organic accompaniments of mental processes. I may take this occasion to say that an attempt to use related methods caused me to be much more skeptical than Leschke seems to be, of the results from the "inner plethysmograph" and balance-board of Weber.

Wells and Forbes (9) give evidence which tends to show that electromotive changes and especially resistance changes in the psychogalvanic test are due to sweat-gland activity. Atropine, which tends to paralyze the sweat glands, obliterates the response with stimuli. When the fingers used in a cell current were coated with paraffin, both the original deflection and the emotional reaction were small. When the paraffin was scraped from the finger-nails only, the original deflection was much increased, but emotional reactions remained very small. When the remainder of the finger was bared, the original deflection was somewhat further increased, the emotional reaction was relatively greatly increased. They find that the use of a cell current will give more uniform and reliable results in the study of emotional reactions than the use of the body current. The latter would merely give the difference between the action of the sweat-glands at the two electrodes, while the former would depend upon the lowered resistance from the combined action at the two electrodes.

In a series of experiments stimulus words were given and the association times were recorded along with the amount of deflection. The subjects classified the degree of emotion called out as: "(A) strongly emotional, (B) rather emotional, (C) rather unemotional,

(F) practically devoid of emotion." On the whole the results show a relationship between the degree of emotion and the amount of electrical change. But this does not hold in individual cases, especially with grades below *A*. There is no such correlation between the association time and either the introspection or the electrical change.

A few experiments with abnormal patients suggest that the failure of ordinary motor response in catatonic stupor "resulted rather from inhibition of reaction than from failure to apprehend." This was DeBruyn's conclusion from vasomotor tests.

Cannon and de la Paz (1) tested the blood from the adrenal veins of a cat before and after the animal had been frightened. They found that the emotion caused an increased adrenal secretion. The persistence of the emotional state may be due to this greater supply of adrenal secretion in the blood.

Miss Washburn and co-workers (7) compared colored paper squares 5 cm. a side with others 25 cm. a side. They found that saturated colors are preferred in the smaller area, except saturated red; the larger area of tints and shades is preferred.

When colors are fixated for one minute the arousal of associations and adaptations may change the affective value (8). Associations have little influence on saturated colors. What they have is favorable. Adaptation is favorable to violet, blue and green, unfavorable to yellow and red. Associations were favorable to the tints and to the shades of violet, green, orange and red. Adaptation was, on the whole, unfavorable to tints and shades.

Prandtl (4) investigated the question whether the feeling content of consciousness has an influence on the time of reading and the accent. He found that serious passages were read more slowly than light ones and stimulating articles were read more slowly than restful ones. With passages which might be either serious or light, according to the point of view, it was found that the subject read them more slowly when made to think of them as serious. In reading serious or stimulating texts or those considered so, more accents were used and more and longer pauses were made, than in reading other texts. Even if the extra time occupied by accents and pauses were subtracted from the total, the reading time for the serious and stimulating passages would still be relatively long.

REFERENCES

1. CANNON, W. B., & DE LA PAZ, D. Emotional Stimulation of Adrenal Secretion. *Amer. J. of Physiol.*, 1911, 28, 64-70.
2. DROŻYŃSKI, L. Atmungs- und Pulssymptome rhythmischer Gefühle. *Psychol. Stud.*, 1911, 7, 83-140.

3. LESCHKE, E. Die körperlichen Begleiterscheinungen seelischer Vorgänge. *Arch. f. d. ges. Psychol.*, 1911, 21, 433-463.
4. PRANDTL, A. Experimente über den Einfluss von gefühlsbetonten Bewusstseinslagen auf Lesezeit und Betonung. *Zsch. f. Psychol.*, 1911, 60, 26-45.
5. REHWOLDT, F. Über respiratorische Affektsymptome. *Psychol. Stud.*, 1911, 7, 141-195.
6. ȘTEFĂNESCU-GOANGĂ, F. Experimentelle Untersuchungen zur Gefühlsbetonung der Farben. *Psychol. Stud.*, 1911, 7, 284-335.
7. WASHBURN, M. F., CLARK, D., and GOODELL, M. S. The Effect of Area on the Pleasantness of Colors. *Amer. J. of Psychol.*, 1911, 22, 578-579.
8. WASHBURN, M. F. and CRAWFORD, D. Fluctuations in the Affective Value of Colors During Fixation for One Minute. *Amer. J. of Psychol.*, 1911, 22, 579-582.
9. WELLS, F. L. and FORBES, A. *On Certain Electrical Processes in the Human Body and their Relation to Emotional Reactions.* (No. 16 of Archives of Psychology). New York: The Science Press, 1911. Pp. 39.

AFFECTIVE PHENOMENA — DESCRIPTIVE AND THEORETICAL

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Fundamental questions are discussed systematically by Rehmke (18) in a second edition of a well-digested treatise, a characteristic feature of which is its attempt to relate feeling, emotion and mood. Feeling (*Gefühl*) is defined as a *Bestimmtheitsbesonderheit des zuständlichen Bewusstseins*. Consciousness being conceived as the individual soul, its state is assumed to be at any given moment simple and unique; hence the momentary feeling is always one of pleasure or displeasure, never "mixed." It is determined, not by any one, but by the totality of the objective factors, those being *massgebend* which are in the focus of attention. A "feeling," in the ordinary sense, is a complex of the affective state and the "determining" and "accompanying" objective components, the "determining" objects of attention giving the kind of feeling, the "accompanying" organic sensations being mainly responsible for its obscure "coloring" and its degree. Mood (*Stimmung*) appears in a certain contrast to "feeling" in that in it organic sensation is the "determining" factor and no particular object occupies the focus of attention. Emotion (*Affekt*) is not contrasted with "feeling," but is "feeling" characterized by the intensity of the "accompanying" organic sensations, which are rightly included in the emotion; we must not, however, confuse, with James and Lange, the bodily changes which give rise

to these sensations and those bodily movements which follow on the emotion and express it.

A novel point of view for the conception of feeling, as of many other mental phenomena, is proposed by Watt (22). Feeling for him is neither a sensation, nor an attribute, nor a unique element, but an experience of a mode of the integration of elements. Pleasure, *e. g.*, may be the result of the mutual harmony of integrations. The theory most nearly resembles activity theories of feeling. Watt has no difficulty in meeting the most obvious objections to the general principle, but admits that the specific integrative basis of feeling is still to seek. Titchener's criterion of feeling, lack of clearness, explained (21) as meaning, not that feeling is dim, but that it is non-clear in the same way that it is non-spatial, is criticised by Watt (23), who finds a state that lacks clearness as unintelligible as a state that lacks duration. The real question appears to be whether feeling, as such, is a possible object of attention. The difficulty comes up in another form in the dispute as to the content of feeling. The common opinion that the *esse* of feeling is *sentire* and therefore indubitable is called in question by Joachim (17), who contends that there is a distinction between "feeling" and "felt" analogous to that between "perceiving" and "perceived" and that accordingly, since everywhere "experiencing" and "what is experienced" are mutually determining correlatives, pleasures and pains are not self-identical qualities attached only in varying degrees to intellectual contents, but differ internally and may be more or less illusory. Tassy (20) refers feelings in general to a twofold origin, one *constituante*, or primary, the other *de spécialisation*, the source of their intellectual meaning. He conceives the "intelligence" as constituted by the association of several relatively autonomic functions, designated respectively as "psychic" (directly implicating personal interest), "mental" (pure ideation) and "organic." Some feelings originate in the mechanism of the mental activity and are then individualized in the psychic; others depend on organic activity and derive their specific character from the mental or psychic mechanism. In connection with a speculative construction of their neurological basis, the author traces, rather obscurely, the origin and complications of certain feelings under the above three heads.

Claparède (10) finds in the discussion of affective memory a double source of confusion, disagreement as to the criterion of memory and misunderstanding of the James theory of emotion. The only indubitable form of affective memory is that constituted by recog-

dition, but that does not necessarily include an "image" of the object, nor is there any proof of the representation, or reproduction, of an affective state except through the intervention of organic processes. But these on the James theory are the causes of actual emotion. To prove affective memory in Ribot's sense we should have to show, what in the author's opinion has not been done, either (a) that the James theory is false, or (b) that in affective memory the organic processes follow the conscious affective phenomena, or (c) that these processes are entirely wanting. The improbability of affective memory is further argued from the utility of the ideal representation of objects not present, whereas there is no such evident need of the ideal revival of what we can actually experience as our own state. Apart from this theoretical discussion, which, of course, does not deny that we remember in some sense our affectively colored experiences, the question has been raised whether we do not tend to forget the disagreeable. Henderson (15) adduces facts and considerations which point to the negative. The different question, whether we tend to banish disagreeable memories, receives a qualified answer: we always strive to banish disagreeableness, and disagreeable thoughts which do not lead to efficient action probably tend to disappear; on the other hand disagreeable memories are important factors in learning by trial and error and in leading to the reconstruction of experience.

Several writers treat specifically of the theory of emotion and other complex affective phenomena. Binet (3, 4), taking as his point of departure the recent demonstration, as he considers it, of imageless thought, puts forth the hypothesis that the whole of psychology is summarized in two "elements," sensations and motor attitudes. Emotion and thought are both attitudes, the attitude in the former being accompanied by strong organic sensations, in the latter by a minimum of subjective sensations and a maximum of objective sensations or images. This distinction, however, is supplemented and qualified by consideration of the coördination of acts expressed by the attitude. The more organized the attitude, the more pronounced, other things being equal, will be its intellectual character; the less organized, the more the phenomenon is one of pure emotion. This hypothesis is regarded by its author as including, while making more definite, the explanations of the same facts by unconscious action, central adjustment, etc., and as constituting a veritable revolution by introducing into psychology the conception of dynamism as opposed to sensationalism. Brown (6) defines "passion" as

an uncontrollable emotion or system of emotional tendencies and criticizes Shand's suggestion of "sentiment" for the latter on account of the literary associations with that term of weakness and placidity. The identification of "tender emotion" with the parental instinct is criticized on the ground that it is also found in the pathos of many æsthetic emotions. Shand's working out of a "sentiment" like love as an organized system of emotions and desires is made the basis of Caldecott's thesis (7), illustrated by the case of St. Catherine of Genoa, that a central emotion can so organize the feelings as to make them constituents of a healthy ideal of life. Two papers on emotional expression read at the last meeting of the American Psychological Association deserve mention. Cannon (8) reported experiments which showed increased secretion of adrenalin, followed by glycosuria, in fear and rage in cats, suggesting that in the wild state these emotions might be useful in providing sugar as a source of energy for flight or attack. Huey (16), emphasizing the incoördination characteristic of emotion, laid special stress on the intellectual and linguistic disturbances. The real cause of emotion, he held, is a failure in the mechanics of brain integration occasioned by factors too difficult of synthesis under the given conditions. The organic theory of emotion is accepted in a qualified way by Chabrier (9), who criticizes James and Lange for not sufficiently allowing for the representative factor. Ideal processes, he maintains, determine the bodily and are essential to explain the complexity, extent and delicacy of the emotion. But they are only affective in so far as they act more or less directly on the organic function.

To the descriptive psychology of æsthetic experience Geiger (14) contributes a finely discriminating study of *Stimmungseinfühlung*. Experimenting first with simple colors, he found that, *e. g.*, the cheerfulness of the color was uniformly experienced as, in some sense, a quality of the color, not as a feeling of the subject. The relation of the subjective mood to this objective character was shown by further experiment to vary considerably; hence differences in the total feeling in consciousness. Both have the same tone of feeling, but that of the mood seems more external to the object, to overlay and suffuse it. The apprehension of the object was found by analysis of the author's own experience to involve four distinct kinds of apprehensive attitude, marked off by abstraction as the objective-passive, the *stellungnehmende*, where the relation between the object and the subject is reciprocal, the sentimental, in which the distinction between my experience and the feeling-character of the object is obliterated in

a still higher degree, and the *empfindende*, in which there is a more or less complete absorption of the object's character in my mood or of my mood in the object. Abramowski (1), whose work, in Polish, is known, however, to the writer only from a French review, suggestively applies to the interpretation of certain æsthetic and other experiences the conception of generic feelings or sentiments derived from past experiences and surviving the loss of their original presentative elements. The existence of such feelings is held to be experimentally demonstrated. According to Abramowski such feelings greatly influence the appreciation of beauty and artistic creation arises from the impulse to give to them a relatively adequate representative embodiment. Mystical experience shows analogous phenomena. Among the forgotten experiences which furnish such generic feelings the author mentions those of infancy, dreams, unnoticed impressions, hereditary memories and telepathy. We have here, perhaps, a clue to the psychological origin of Plato's doctrine of the reminiscence of Ideas.

The symptoms of many conditions of mental distress are described by Baker (2) in an article whose main purport is a plea for their more adequate recognition as mental rather than as bodily. He tells the pathetic story of a lady afflicted with Parkinson's disease who, with infinite patience, succeeded in the course of two years in spelling out, by means of children's blocks, a brief account of her mental state. Francia (11) reports the sorrows of a nervous little girl and describes the process of their alleviation. One important conclusion is that the series, sorrow—immediate reaction—substituted mental state, must be supplemented by an obscure sense of vitality at the decisive moment. Special interest attaches to the discussion before the American Pathological Association (19) as indicating the trend of opinion, at least in America, regarding the pathogenesis of emotional states of recurrent fears, phobias and anxiety. Much of the discussion dealt with the two Freudian doctrines, (a) of a distinct anxiety-neurosis, as over against phobias, and (b) the sexual origin of the former. False abstraction was charged against the first of these doctrines, hobby-riding against the second, both being defended by Jones and Putnam. Sidis regarded anxiety as simply the working of the instinct of fear, the obsession of which, conscious or unconscious, he held to be the tap-root of every functional psychosis. Prince traced the mechanism of recurrent psychopathic states mainly to the automatism of the "neurograms" established by residua of past experience combined with the fear instinct operating by auto-

suggestion. The original attack always arises, he thinks, in some psychical trauma. There is, however, an incomplete type of attack, identical with Freud's anxiety-neurosis, where the fear (anxiety) is expressed in the appropriate physiological symptoms without specific ideas to which it attaches itself. Prince thinks that in such cases the ideas are unconscious or co-conscious. The explanation varies with the cases. There is no fear, he thinks, apart from some experience suggesting danger. But in some cases the fixed ideas are mere cat's-paws made use of by the neurographic residua of other past experiences functioning in an unconscious process. The psychasthenia to which these states are commonly referred may itself, he thinks, be a consequence of other unconscious factors. Southard contributed a possibly important suggestion by distinguishing three types of etiology for these cases, vestigial (hereditary), residual (ontogenetic) and neoplastic (formed independently in the course of the disease).

Two authors treat at length of specific passions. De Fursac (13) brings together into a book the articles noticed here¹ a year ago on avarice, with an added chapter on pseudo-misers and a conclusion. He believes the vice incurable in the individual, but thinks that social changes are likely to greatly diminish in the future the number of its victims. Friedmann (12) gives what is probably the most exhaustive study of jealousy in scientific literature. Largely owing to the influence of Shakespeare, whose Moor of Venice is taken as the type of jealous passion, the term "jealous" has tended among ourselves to be conceived too narrowly and to lose connection with the etymologically identical term "zealous." Friedmann shows impressively the wide range of the passion, not only in love, but in every kind of competition in the family, in office and calling, in art, in science, in public life, between nations as well as between individuals. Its essential elements are the feeling of disturbed excitement in contemplating a rival and the impulse to drive him from the field. These are complicated and strengthened by feelings of fear, envy and wounded *amour propre*. The probable basis of the feeling is found in the impulse, prominent in sport, to actively participate in what we see another doing when we ourselves are prepared by habit and strong feelings of pleasure to do the same. The passion, which the author regards as one of the greatest of evils, is richly illustrated by facts from the animal world, by a survey of its manifestations among different peoples and different stages of civilization and, as might

¹ PSYCHOLOGICAL BULLETIN, 1911, 8, 166.

be expected from a specialist in nervous diseases, by pathological facts, some of which are of a rather startling character

Finally, reference may be made to Bridou's work (5) on the education of the sentiments, which is based on the conception of a law of functional subordination and directed especially against the imperfections and narrowness of French education.

REFERENCES

1. ABRAMOWSKI, E. Les sentiments génériques en tant qu'éléments de l'esthétique et du mysticisme. *Przegląd filozoficzny*, 1911, 14, 156-185. Reported, *J. de psychol. norm. et path.*, 1911, 8, 368-371.
2. BAKER, S. The Relative Importance of Mental Pain. *Pop. Sci. Mo.*, 1911, 79, 355-368.
3. BINET, A. La nature des émotions. *J. de psychol. norm. et path.*, 1911, 8, 258 f.
4. BINET, A. Qu'est-ce qu'une émotion? Qu'est-ce qu'un acte intellectuel? *Année psychol.*, 1911, 17, 1-47.
5. BRIDOU, V. *L'Éducation des sentiments*. Paris: Doin, 1911. Pp. 403.
6. BROWN, W. Emotion and Morals. Reported, *Nature*, 1911, 86, 125 f.
7. CALDECOTT, A. Emotionality: a Method of its Unification. *Proc. Arist. Soc.*, 1911, 11, 206-220.
8. CANNON, W. B. Some Recently Discovered Physiological Changes Attending Fear and Rage. Reported, *PSYCHOLOGICAL BULLETIN*, 1912, 9, 73.
9. CHABRIER (DR.) *Les émotions et les états organiques*. Paris: Alcan, 1911. Pp. 159.
10. CLAPARÈDE, E. La question de la "mémoire" affective. *Arch. de psychol.*, 1911, 10, 361-377.
11. FRANCA, G. Sul meccanismo dell' auto-consolazione. *Riv. di psicol. appl.*, 1911, 7, 105-144.
12. FRIEDMANN, M. *Ueber die Psychologie der Eifersucht*. Wiesbaden: Bergmann, 1911. Pp. vii + 112.
13. FURSAC, J. R. DE. *L'Avarice: Essai de psychologie morbide*. Paris: Alcan, 1911. Pp. 185.
14. GEIGER, M. Zum Problem der Stimmungseinfühlung. *Zschr. f. Aesth. u. allg. Kunstw.*, 1911, 6, 1-42.
15. HENDERSON, E. N. Do We Forget the Disagreeable? *J. of Phil., Psychol., etc.*, 1911, 8, 432-437.
16. HUEY, E. B. Emotivity and Emotion in their Relations and Adaptation. Reported, *PSYCHOLOGICAL BULLETIN*, 1912, 9, 63.
17. JOACHIM, H. H. The Platonic Distinction between "True" and "False" Pleasures and Pains. *Phil. Rev.*, 1911, 20, 471-497.
18. REHMEKE, J. *Zur Lehre vom Gemüt*. 2te umgearb. Aufl. Leipzig: Dürr, 1911. Pp. viii + 115.
19. Symposium and Discussion on the Pathogenesis of Morbid Anxiety at the Meeting of the American Pathological Association in Baltimore, May 10, 1911, together with the President's Address on this and related topics. *J. of Abnorm. Psychol.*, 1911, 6, 81-181.
 - (1) JONES, E. The Pathology of Morbid Anxiety.
 - (2) SIDIS, B. Fear Anxiety and Psychopathic Maladies.

- (3) DONLEY, J. E. Freud's Anxiety Neurosis.
- (4) PRINCE, M. The Mechanism of Recurrent Mental States, with Special Reference to Anxiety States.
- (5) Discussion by J. J. PUTNAM, T. A. WILLIAMS, J. H. CORIAT and others.
- 20. TASSY, E. Essai de classification des états affectives. *Rev. phil.*, 1911, 71, 690-704; 72, 72-89.
- 21. TITCHENER, E. B. Feeling and Thought: a Reply. *Mind*, 1911, 20, 258-260.
- 22. WATT, H. J. The Elements of Experience and their Integration: or Modalism. *Brit. J. of Psychol.*, 1911, 4, 127-204.
- 23. WATT, H. J. Feeling and Thought: a Restatement. *Mind*, 1911, 20, 402-404.

ATTENTION AND INTEREST

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Grassi (6) measured the effect of concentrated and dispersed or well-directed and misdirected attention upon reaction times. The experiments consisted in comparing the touch reactions to contact upon parts of the body where the stimuli were expected with those to stimuli upon unexpected places. Three degrees of preparation were distinguished. In the first the stimuli were all on the same part of the body, to which attention was directed in advance. In the second the stimuli were given alternately on each of two parts of the body for which preparation was had in advance. In the third touches upon unexpected parts of the body were interspersed irregularly in a series of the first sort. It was found that times increased from one to three for each sort of attention. Even longer times were found when the subject was surprised by the contacts. The writer explains the increased times for the less prepared spots as an expression of the time required to adjust the mental gaze to the new spot.

Jacobson (7) extends the experiments of Heymans on inhibition of liminal stimuli to supraliminal values. He compared weights and sounds with each other when other weights or sounds were also acting simultaneously and found that simultaneous stimuli always exerted an inhibitory effect. The weight or sound seemed less intense if another stimulus were given with it than if it were present alone. Similar diminution of intensity was observed if attention were relaxed on one stimulus. It was also found that the inhibiting effect of one stimulus upon another might be overcome by increased attention. He makes no attempt to connect the decrease in intensity with the decrease in clearness reported by other authors.

McComas (9) tests the methods of determining types of attention.

The work grew out of the statement of Stern and Meumann that it was possible to divide individuals into well marked classes on the basis of widely or narrowly distributed attention. He correlated the span of attention for words and colors, the span for auditory impressions, the ability to concentrate against distraction (inhibition) both in auditory and in visual attention, and the correlation of all with the type of imagery. Some of the more important conclusions are that there is a broad and a narrow spanned type of attention, and a close correlation between the span for auditory and visual attention. There is also an active, alert attention and a sluggish attention; the former is broad spanned. The ability to concentrate and inhibit and the dexterity of attention seem to have no close correlation with other qualities. Of the ideational types the visual has a broad span for both visual and auditory impressions, while the auditory has marked ability to inhibit sound and a large span for visual and auditory impressions given simultaneously. The motor type shows no marked correlations. There are a large number of incidental points that we have no space to mention, but which are of importance for other problems in attention.

Prager (10) studies the relations between defects of attention and control of associations. He raises two questions: (1) Does a disturbance of the function of association accompany disturbances of attention (*Merkfähigkeit*)? (2) Is it possible to discover in association tests any phenomenon that is directly connected with disturbances of attention? The questions are answered in the light of association tests on four patients who suffered from impairment of attention. The first is answered in the affirmative. All the patients showed lengthened reaction times and a tendency to the sentence form of association. The associations took the form of explanation, descriptions and egocentric responses toward the stimulus word. To the second question an affirmative answer is also given. Successive responses to the same word by the Pappenheim method showed no great shortening of the reaction time and little tendency to repeat the response. Both course of association and immediate retention are impaired with degeneration of capacity for attending. Another study of attention in pathology is by Franchini (5). His experiments consisted of a measure of the simple reaction times of patients. In general it is found that reaction times are slow and irregular and that there is a marked tendency to fatigue for all pathological mental states. Imbecility, dementia precox, the alcoholic and involution psychoses are marked mainly by the two former symptoms, the circu-

lar insanity by the quick onset of fatigue. In one article D'Allonnes (2) gives the results of a conceptual analysis of the attention processes as they are found in the insane. He insists that we must distinguish four varieties of attention, the momentary and the prolonged, the spontaneous and the provoked, and that these are present in different degrees and in different combinations in different cases. In order of disappearance they run from the light cases to the severe, the prolonged and provoked, the prolonged and spontaneous, the momentary and spontaneous, and the momentary and provoked, if we couple the forms as they are likely to be found in actual cases. He gives a long list of the symptoms under each of eight stages in the degeneration of attention. Much of it must however be largely hypothetical and no two men would agree on the details. In another paper (1) he reports a new and simple method of measuring disturbances of attention of momentary duration. The apparatus or device is a square with five divisions on each side, numbered vertically up to five and with five horizontal columns headed by the vowels. The problem is to point to the intersection of a line headed by a vowel and a line designated by a number. Thus a patient is asked to point to o3 and the time required to find it is measured. It was found that the time was increased for cases of dementia and mania over that required by normal individuals and that the more severe the case the longer the time.

A. Busch (3) has conducted a long series of experiments upon the effect of alcohol upon attention. Three measures were used; two upon attention proper and one of simple visual acuity. First the distribution of attention was measured by a device similar to Wirth's. This indicated that the more important effect was to narrow the field of attention. The figures in the periphery of the field of vision were very much more likely to be overlooked after a dose of 30 c.c. of alcohol than when normal. The central region is also affected in some degree, but not so noticeably. The second experiment consisted in measuring the apperception of letters by the Finzi method. This showed the same effect in more marked degree. A third series tested visual acuity under alcohol and found that it was either practically unaffected or increased. The effects noted are to be referred to the effects of alcohol upon the central processes, in spite of the increased efficiency of the peripheral nervous system. The effects could be noted at least twenty-four hours after the dose and were cumulative.

Dearborn (4) gives a summary of the bearing of attention in its different aspects upon exercise and physical education in general.

He combines a vasomotor, with a nervous coördination theory. It is valuable largely for its practical suggestions to the teacher of physical education.

Two papers of a more theoretical character have appeared. Rignano (11, 12) in an article published both in French and in German advances the theory that attention arises from a conflict between two affective inclinations. In the second part of his work he argues that intensity and choice of memories really depend upon this affective element, that associations alone will not really explain. On the nervous side he explains these processes by the interaction of different nervous processes either in harmony or in opposition. He does not make very clear, however, the exact relation between sensation and affection or between the affective elements and the nervous currents. Lüdtke (8) traces the history of the word apperception from Leibniz to Lipps and Jerusalem in German psychology. He points out the different meanings that it has had for different men and the inconsistencies in use by different men, particularly by Wundt, and ends with a plea that it be discarded from the psychological and philosophical vocabulary.

REFERENCES

1. D'ALLONNES, G. R. Recherches sur l'attention. *Rev. phil.*, 1911, 71, 285-312; 494-520.
2. D'ALLONNES, G. R. Procédé clinique pour mesurer la rapidité de l'attention. *J. de psychol. norm. et path.*, 1911, 8, 47-51.
3. BUSCH, A. Ueber den Einfluss des Alkohols auf Klarheit und Umfang des optischen Bewusstseins. *J. f. Psychol. u. Neur.*, 1910, 17, 63-82; 1911, 18, 36-71.
4. DEARBORN, G. V. N. Attention: Certain of its Aspects and a Few of its Relations to Physical Education. *Amer. Phys. Educ. Rev.*, 1910, 15, 559-571; 637-650; 1911, 16, 26-40; 125-143; 186-199.
5. FRANCHINI, G. Le graphique psychometrique de l'attention dans les maladies mentales. *Arch. ital. de biologie*, 1911, 54, 267-277.
6. GRASSI, ISABELLA. Einfache Reaktionszeit und Einstellung der Aufmerksamkeit. *Zsch. f. Psychol.*, 1911, 60, 46-72.
7. JACOBSON, E. Experiments on the Inhibition of Sensations. *PSYCHOL. REV.*, 1911, 18, 24-53.
8. LÜDTKE, F. Kritische Geschichte der Apperzeptionsbegriffe. *Zsch. f. Phil. u. phil. Krit.*, 1911, 141, 41-135.
9. MCCOMAS, H. C. Some Types of Attention. *PSYCHOLOGICAL MONOGRAPHS*, 1911, 13, whole No. 55.
10. PRAGER, J. J. Experimenteller Beitrag zur Psychopathologie der Merkfähigkeitsstörungen. *J. f. Psychol. u. Neur.*, 1911, 18, 1-22.
11. E. RIGNANO, E. De l'attention. I. *Scientia*, 1911, 10, 165-190. II. 1912, 11, 71-87.
12. RIGNANO, E. Von der Aufmerksamkeit. *Arch. f. d. ges. Psychol.*, 1911, 22, 267-311.

TIME AND RHYTHM

BY KNIGHT DUNLAP

The Johns Hopkins University

Basler (1), from a very few observations with excellent apparatus, concludes that two tactual stimuli on the same area fuse when separated by an interval of about 50σ , or less, on finger tip, and by longer intervals on other parts of the hand. He points to the difference between such intervals and the intervals found adequate by other observers with serial stimulations—from a few σ to less than one σ . In his second paper (2) Basler reports a similar peculiarity of light stimuli. The maximal interval permitting fusion between two stimuli, produced by revolving sector, was 83σ , whereas the maximal interval for flicker was 33σ .

Brewer (3) and Stratton (10) determined the thresholds of duration between two successive visual stimulations on different retinal areas, and the thresholds for movement-duration. Brewer, with five subjects, using an exposure-pendulum which gave two points of light or a moving point, found thresholds of from 2σ to 58σ for discrete succession merely, 19σ to 76σ for motion merely, 22σ to 61σ for order, and 19σ to 76σ for direction. The differences due to angular separation and length of movement are inconsiderable. Stratton, with two subjects, using the pendulum, and a wheel-pendulum, exposing successively the two halves of a streak of light, or equivalent motion of a half, obtained thresholds of 16.4σ and 14.8σ for mere succession and 31.5σ and 13.8σ for mere motion. Both experimenters used the method of serial groups which in the reviewer's estimation detracts from the significance of the definite values of the thresholds, but does not diminish the general importance of the results.

Pauli (9) investigated the temporal relations of two visual stimuli, one foveal and one peripheral. He worked with two small surfaces illuminated by Geissler tubes, controlled by the time attachment to the Zimmermann kymograph. He found that of two simultaneous stimuli, the foveal was sensed first, the peripheral stimulus needing to be advanced 50σ to 100σ to make the two appear simultaneous. The differential increased with the angular separation of the stimuli, and with the intensity and area of the foveal stimulus; it was greater for the temporal field. The direction of attention had no influence (Dvorák and Bethe had reported such influence). In this part of the work Pauli apparently took no account of eye-movement.

The phenomenon observed by Mach from which these experiments grew—the green appearance of a momentary red light in peripheral vision—was also found to be unaffected by the direction of attention.

Pauli also attempted to measure the rapidity of change (spatial) of visual attention, using a method suggested by Külpe: to find the time interval between two stimuli, 10° to 60° apart, which brings the second just as the attention is ready for it. This time, 80 σ to 170 σ , Pauli thinks to be not a function of eye-movement, because similar experiments with voluntary eye-movements gave a much longer time.

It would seem remarkable that the significant American work in eye-movement should be so neglected by the Germans, were it not that they seem to be unaware of progress in many other lines also.

Gildmeister (7) remarks on a difficulty he finds in counting repetitions of a given process (pulse, etc.), and recommends the use of some melody involving an eight-rhythm ($4/4$ or $2/4$): the observer need only notice the tone on which the observation ends; computing the number subsequently; or, after habituation, obtaining it directly from association with the note. This method should be useful to any one afflicted as Gildmeister is.

For estimating a time interval, in default of mechanical aids, Gildmeister finds it useful to run over a melody in march tempo; with a certain melody he is able to come within 10 per cent. of 120 measures to the minute. Hence, he needs to note only the number of repetitions and point of ending in the final repetition.

Dunlap, in his first article (5), argues for the explicit consideration of rhythmic grouping as a function of the specious present. In his second article (6) he gives the results of experiments undertaken with this consideration in view. The threshold of difference for rate of discrete auditory stimulation (50 per cent. discrimination in the author's tables and charts, which is the same as 75 per cent. right judgment by the traditional method) is lower with rhythmic grouping than without; while not appreciably higher for series with irregular intensities and durations of stimuli than for regular series. The difference-thresholds for time-intervals corresponding to the rates used, were appreciably higher. Experiments with two intensities of auditory stimuli, and others with two modes (auditory and visual), give results which the author thinks speak for strain-sensations as time-content.

Brown (4) reports mean variations of the measurements of force and time-relations of rhythmic tapping; of rhythmically vocalized syllables; and of a mother goose jingle. The mean variation for the

force of the foot or foot element is from 2 to 4 times as large as the mean variation of the duration of the same. This is an indication that the time element is more fundamental than the accent in rhythm.

Landry (8), in a volume which he opines "n'est que trop succinct," presents the results of some measurements of the rhythm and tempo of French verse and prose declaimed by various persons ranging from Bernhardt and Mounet-Sully to illiterates. Considerable space is given to a very good discussion of the psychology of rhythm, which however does not seem to advance the subject; and there is also a discussion of the rhythmic peculiarities of spoken French which is certainly interesting and informing, although the reviewer makes no pretense of being able to judge of its accuracy. One point is however made quite clear (particularly by Livre II., Chap. I.): in these matters no foreigner need hope to do more than accept the opinion of the Frenchman whom he believes to be the most competent authority.

The two important indications in Landry's results are (1) that the rhythmic divisions are controlled but slightly by the significance of the word-groups, and not at all by logical word-relations, and (2) that increase in emphasis of an element increases its duration; but these are not new discoveries.

REFERENCES

1. BASLER, A. Ueber die Verschmelzung zweier nacheinander erfolgender Tastreize. *Pflüger's Arch.*, 1911, 143, 230-244.
2. BASLER, A. Ueber die Verschmelzung zweier nacheinander erfolgender Lichtreize. *Pflüger's Arch.*, 1911, 143, 245-251.
3. BREWER, J. M. The Psychology of Change; on Some Phases of Minimal Time by Sight. *PSYCHOL. REV.*, 1911, 18, 257-261.
4. BROWN, W. Temporal and Accentual Rhythm. *PSYCHOL. REV.*, 1911, 18, 336-346.
5. DUNLAP, K. Rhythm and the Specious Present. *J. of Phil., Psychol., etc.*, 1911, 8, 348-354.
6. DUNLAP, K. Difference Sensibility for Rate of Discrete Impression. *PSYCHOL. REV.*, 1912, 19, 32-59.
7. GILDMEISTER, M. Ueber Zählen und Zeitschätzen. *Zsch. f. biol. Technik u. Methodik*, 1911, 2, 49-52.
8. LANDRY, E. *La théorie du rythme et le rythme du français déclamé*. Paris: Champion, 1911. Pp. 427.
9. PAULI, R. Ueber die Beurteilung der Zeitordnung von optischen Reizen in Anschluss an eine von E. Mach beobachtete Farbenerscheinung. *Arch. f. d. ges. Psychol.*, 1911, 21, 132-218.
10. STRATTON, G. M. The Psychology of Change; How is the Perception of Movement Related to That of Succession? *PSYCHOL. REV.*, 1911, 18, 262-293.

SPECIAL REVIEWS

THE ORIGINS OF MUSIC

Die Anfänge der Musik. CARL STUMPF. Leipzig: J. A. Barth, 1911.
Pp. 209.

In this interesting little book the author draws in a simple and popular manner the conclusions which may be reached from recent studies of primitive music. It should perhaps be noted at once that the use of the term *primitive* is to be taken relatively, not literally. Careful study of the structure of exotic melodies usually reveals the fact that they represent a considerable degree of cultural evolution. Only by reference to relative simplicity of structure may we approach a conception of the beginnings of music.

The book deals first with certain recent theories as to the origin of music. The Darwinian theory is characterized by the phrase: "Im Anfang war die Liebe." Here it is noted that Darwin's attempt to derive music from sexual selection gives no adequate explanation of the unique ability to recognize and transpose melodies. So far as we yet know animals have no capacity of this order. Bird songs seem to depend upon absolute pitch, whereas human music is based upon a recognition of tonal relations which involves a capacity for abstraction which the animal does not appear to possess. Spencer's theory is characterized by the phrase: "Im Anfange war das Wort," indicating a derivation from accent and tonal variations in speech. But music differs essentially from singing-speech in the use of fixed intervals. In speech, on the contrary, it has been shown that the sounding of a single syllable shows great variation in pitch. Similarly the view that music finds its origin in rhythm, as characterized by Hans v. Bülow's phrase: "Im Anfange war der Rhythmus," is equally unsuited to explain the facts, since the problem of definite intervals remains unsolved. Rhythmic expression may involve differences in intonation, but it makes no demand for consonant intervals. Furthermore, the most primitive songs known to us evidence a regard primarily for musical composition, rather than any definite aim or requirement of rhythmic expression. The oft-cited rhythmic accompaniment of work done by a group in unison is not found among the most primitive tribes, but seems to indicate a stage in cultural evolution beyond that at which music appears.

To explain the origin of music we must have in mind, not merely tonal expression of any arbitrary sort, but the use of tones in definite relationships. The explanation for this phenomenon finds its basis for Stumpf in the inherent capacity to recognize tonal fusion. He therefore characterizes his own explanation by Goethe's phrase: "Im Anfang war die Tat." The problem is, how did primitive man discover this natural capacity? Stumpf believes that the essential facts were first brought to his notice through the use of vocal signals. In signalling the production of an intense and relatively fixed high tone is demanded. The duplication of this tone by men, women and children, whose vocal register naturally varies, brings about the expression of similar tones which appear to be identical because they fuse. Thus in the attempt of voices of different range to produce the same tone, we see the first use of the consonant intervals of octave, fifth and fourth which furnish the framework for all music. Little by little these intervals are recognized as such, even when the absolute pitch varies.

The first melodic phrases may be due to the filling-in of the interval of the fourth, say, with arbitrary tones. Brief phrases constructed from such tones are well adapted to use as signal calls, and it is noted that, among the most primitive songs recorded, the fourth and fifth represent the greatest intervals used, indeed they often limit the total range of the melody. Thus we see that although the steps in primitive music are often arbitrary and sometimes variable, they are nevertheless constrained by the limit of a consonant interval. The evolution of music is dependent upon the reconciliation of these small steps with the consonant intervals which furnish the framework and basis of transposition. Polyphony is found very early in parallel passages where various members of a family may duplicate the melody simultaneously in octaves, fifths and fourths. The use of the falsetto, which is very frequent, also indicates an attempt to imitate the precise register of a certain individual.

From primitive instruments we may learn much concerning the origins of music, although it is well to remember that many very simple forms of instrument now in use probably represent a retrograde development from forms originally much more complex. Pipes are among the most ancient instruments of which we have knowledge. The introduction of holes to produce a variety of tones was doubtless determined at first, not in accordance with musical principles, but by external conditions. For instance, the rings of the bamboo, and the use of three or six fingers seem to have been prominent factors.

Pipes of varying length are combined in the Pan's-pipes which may follow one another in pitch, or form groups, sometimes even giving a definite melody. We are not to conclude from this, however, that the intervals used by a people are entirely arbitrary, varying from individual to individual. On the contrary, even though the scale contains not a single pure consonance, the relation of the intervals is fixed and duplicated with remarkable exactness in all the instruments of a tribe.

Among some of the wind instruments there occurs the possibility of blowing higher tones (*Überblasen*), thus producing harmonics in definite consonant relationship to the fundamental. This may be considered as a contributory cause for the use of consonant intervals. It is not a primary cause, however, for these intervals are quite as well known among people who have no such instruments. String instruments appear to have their origin in a modification of the hunter's bow. The musical-bow, much used by primitive people, is a single stringed bow which indicates this analogy clearly. Drums are found in great variety with varying tones, but no consonant effects. The xylophone and metallophone are among the most interesting of exotic instruments, since with their aid we can study most exactly the scale of intervals in use. Here, as with the Pan's-pipes we learn the exactness with which unmusical intervals are employed.

The pleasure in manifold combinations, developments and resolutions of accords is a modern invention. Primitive music is essentially homophonic; dissonances without resolution are frequent. The use of polyphony is quite different from that which we make of it. Aside from the parallel passages, already noted, the repetition of a fixed tone is often met with, similar to the drone-bass or bourdon. However, if polyphony is undeveloped, rhythmic accompaniment has evolved to a point quite beyond our ordinary capacity. This is due primarily to the lack of polyphony, which requires for its performance relatively simple rhythms. The rhythmic accompaniments to the songs of primitive peoples are often extraordinarily complex, and we find that five- and seven-part measures are not at all exceptional. The rhythmic setting is also characterized by a frequent and complicated shifting from one tempo to another.

The appearance of a fixed scale indicates the usage of five and seven intervals within the octave as the most common divisions. Two methods of development may be distinguished: (1) the construction of a scale by reference to the consonant intervals of fourth,

fifth, and later, the third, with a more or less arbitrary filling-in of the larger steps; (2) the construction of a scale by a purely arbitrary division into five or seven steps of equal intervals, as may be found in the Siamese and Javanese scales, respectively. Even in this case, however, the limiting interval is the octave, so we may say that all scales in their development are in some measure limited by the principle of consonance.

An interesting polyphonic orchestral usage among certain Asiatic peoples is noted. The principle of these compositions is a more or less independent elaboration and variation upon a central melodic theme, which is carried out in unison by the different instruments of the orchestra. The effect upon our ears, trained to harmonic combinations, is very strange, but to a people whose musical development has been strictly homophonic, the effect is apparently agreeable. Stumpf proposes to call this form of composition *heterophony*, a term which he derives from a passage in Plato which describes what appears to have been a similar practice among the Greeks.

The second part of the volume consists of a series of transcriptions of exotic melodies, largely derived from the phonogram archives of the Berlin Laboratory, with a running commentary on varying peculiarities and principles of construction. The examples include melodies from the Wedda of Ceylon—the most primitive forms of music which we now know,—the Andamanese, the Kubu of Sumatra, Australian aborigines, South American, Mexican and North American Indians, the Eskimos, Greenlanders and the African Negroes. There are also appended eleven plates illustrating primitive musical instruments.

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DISCUSSION

THE PSYCHOLOGY OF ADVERTISING

A recent review¹ of Strong's *The Relative Merit of Advertisements* displays so inadequate an appreciation both of the problem of that suggestive monograph and of the tendencies of modern experimental psychology in general that I am impelled to call further attention to the work. It is much to be regretted that this book should have been reviewed by one who failed to discriminate between a personal point of view and the total content of a large and growing science; between individual inclination for certain species of problem and "the very characteristics of a psychological experiment."

From the fact that the mathematical portion of the work in question may have been puzzling to the reviewer it does not at once follow that a search for exact measurement of complex mental processes is "detrimental to good psychology." There are indeed psychologists who are temperamentally disposed to be equally short-sighted and to assert that it is just the "detailed introspection" and the "qualitative distinctions" that get nowhere. The fact is, however, that qualitative distinction and quantitative analysis are both needed in a psychology that is "good."

Two further things are also true. The first is that a piece of work which emphasizes the latter type of inquiry reflects the trend of by far the greater part of current investigation and interest. One familiar with the contents of current periodicals and recent treatises will require no proof of this fact. The second truth is that a large body of students and teachers have been convinced that a psychology which refuses to be both sterile and unstimulating, but which aspires to be adequate and serviceable in its treatment of conscious individuals, must busy itself with outcome, conduct and behavior as much as, if not even more than, with mere content and qualitative elements and patterns.

As the writer has already insisted: "A psychology which aims to be an account of behavior cannot go far without making a careful study of more complex judgments such as those of appeal and interest. Especially will this be true of a psychology which aspires to be con-

¹ PSYCHOLOGICAL BULLETIN, March 15, 1912, p. 124.

cretely serviceable. Such a psychology will find but little use for the introspective method. It will be interested, not in the momentary content of a conscious moment; nor in the descriptive character of the sensory fragment which may at the moment be the bearer of meaning; nor in the instrument, criterion or vehicle of an act of apprehension, a comparison, a feeling or a choice. It will be most of all interested in the outcome of this moment in the form of behavior, an act, a choice, a judgment, and in the character, reliability, constancy and significance which the outcome of such a mental operation bears."¹

To return to the review in question, the paragraph presented by Mr. Tait as embodying the "chief results" quite ignores the real problem, which was the measurement of the relative strength of various appeals and interests, and the determination of the dependence of these measurements on such factors as commodity, sex, class and copy differences. The paragraph cites only certain interesting facts which came out as by-products in the course of the inquiry.

Not until the importance of this type of study is fully realized shall we possess a body of principles that will really convey information concerning human nature and human behavior, a knowledge which the psychology which Mr. Tait seems to have been taught has so far failed to deliver. If a personal opinion be permitted by way of contrast with that of the reviewer, the writer would like to express his conviction that pure qualitative and introspective distinctions fall as far short of an adequate psychology as the conversational description of a stomach-ache falls short of being a complete account of the laws of digestion.

It is however not clear what the reviewer means by saying "any detailed introspection is lacking." The *determination* to introspect and to report the introspections as such was purposely avoided, and with good reason. But the determination to introspect and to report is apparently not a sufficient criterion of introspection. Indeed one of the foremost exponents of the introspective methods has remarked: "After all, therefore, it is not so absurd as at first thought it seems, to say that we require the animal and society and the madman to introspect. . . . All three may attend; all three may report their experiences."² Is a report any the less introspective, in the final sense, because it is expressed by gesture, by behavior or by arrangement or indication of stimuli, rather than vocally or graphically?

¹ Judgments of Persuasiveness. PSYCHOLOGICAL REVIEW, July, 1911.

² TITCHENER, *A Text-Book of Psychology*, p. 35.

The reviewer was quite right when he remarked, "By a conglomeration of vague preferences under still vaguer headings, we can never reach the basis of appeal." But Strong seems to have fully realized this even before he set about his investigation. It was just this conglomeration which the psychology of appeal had previously contained, and for which "The Relative Merit of Advertisements" suggests the substitution of definite judgments and weighted comparisons, quantitatively as well as qualitatively expressed.

Whether this type of work is or is not to be called "psychological" depends of course on the idiosyncrasies of one's vocabulary. A study of the relative strength of appeals and interests, of the certainty and constancy of the judgments passed upon them, of the possibilities of the exact measurement of the relations to be found among such complex stimuli, and of individual, sex and class differences in these respects, may not fall within that field of psychological inquiry which happens to be the most interesting to one or to several particular individuals. But the science is surely larger than any one set of interests. Let us not quibble over the use of a word. Even a quibbler should observe that the subtitle of the monograph in question includes both its psychological and statistical aspects.

My purpose in writing is not to defend either the matter or the method of this pioneer work in the application of exact method to a phase of applied psychology which has hitherto been satisfied with mere generalities. These features are amply justified by the immediate results of Strong's work. My purpose is to put on record the conviction of many BULLETIN readers that human nature is larger than any one personal point of view, and that any attempt to extend the problems, methods and applications of psychological investigation should be both welcomed and encouraged.

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BOOKS RECEIVED DURING MARCH AND APRIL

- SCHILLER, F. C. S. *Formal Logic. A Scientific and Social Problem.* London: Macmillan, 1912. Pp. xviii + 423. \$3.25 net.
- STUMPF, C. *Die Anfänge der Musik.* Leipzig: J. A. Barth, 1911. Pp. 209. Mk. 6.60; geb. Mk. 7.50.
- LEE, V., and ANSTRUTHER-THOMSON, C. *Beauty and Ugliness. And Other Studies in Psychological Aesthetics.* London and New York: John Lane Company, 1912. Pp. xiii + 376. \$1.75 net.
- RICE, D. E. *Visual Acuity with Lights of Different Colors and Intensities.* (No. 20 of Archives of Psychology.) New York: The Science Press, 1912. Pp. 59.
- BEAN, C. H. *The Curve of Forgetting.* (No. 21 of Archives of Psychology.) New York: The Science Press, 1912. Pp. 45.
- HODGE, F. A. *John Locke and Formal Discipline.* Lynchburg, Va.: J. P. Bell Co., 1911. Pp. 31.
- LEVI, A. *Studi Logici. II. Il trascendentalismo logico.* Firenze, 1911. Pp. 34.
- LEVI, A. *La Filosofia dell' Esperienza. II. La Filosofia dell' Intuizione primitiva.* Bologna, 1911. Pp. 31.
- HARTENBERG, P. *Traitement des neurasthéniques.* Paris: Alcan, 1912. Pp. 346. 3 fr. 50.
- MEYERSON, É. *Identité et réalité.* (2d ed.) Paris: Alcan, 1912. Pp. xix + 542. 10 fr.
- DUNLAP, K. *A System of Psychology.* New York: Scribner, 1912. Pp. xiv + 368.
- JOHNSTON, C. H. *High School Education.* New York: Scribner, 1912. Pp. xxii + 555.
- PERRIER, L. *Le Sentiment Religieux a-t-il une origine pathologique?* Paris: Fischbacher, 1912. Pp. 63.
- [ANON.] *Sixty-fourth Annual Report of the Trustees of the Massachusetts School for the Feeble-Minded at Waltham for the year ending November 30, 1911.* Boston: Wright & Potter Pr. Co., 1912. Pp. 48.
- DORSEY, J. O., & SWANTON, J. R. *A Dictionary of the Biloxi and Ofo Languages.* Bureau of American Ethnology, Bulletin 47. Washington: Gov. Printing Co., 1912. Pp. 340.

NOTES AND NEWS

THE Ninth Annual Meeting of the Experimental Psychologists was held at Worcester, Mass., April 15-17.

PROFESSOR LILLIEN J. MARTIN, of Stanford University, gave an address entitled "Ueber die Lokalisation optischer Vorstellungsbilder" at the V. Kongress für experimentelle Psychologie, held in Berlin, April 15-19.

At the National University of Mexico Professor J. M. Baldwin is delivering the second half of the two years' program of lectures on psychosociology. In addition to these lectures a course in the history of psychology is also announced.

A NEW periodical, *Imago*, is announced from Vienna, edited by Professor S. Freud and published under the direction of Otto Rank and Dr. Hanns Sachs. It is to be devoted to the application of psychoanalysis to the entire field of the mental sciences.

THE April number of the BULLETIN, dealing with psychopathology, was prepared under the editorial care of Dr. Adolf Meyer, of the Johns Hopkins Hospital.

THE following items are taken from the press:

DR. J. E. W. WALLIN has been appointed assistant professor of educational psychology and director of the recently established department of clinical psychology in the school of education of the University of Pittsburgh.

THE coming session of the Dartmouth Summer School will be in charge of Dr. W. V. D. Bingham, director of the psychological laboratory, and professor of psychology and education.

DR. GEORGE H. MOUNT has resigned his position as instructor in psychology in the Northern Michigan State Normal School to accept an assistant professorship in the Iowa State Teachers' College.

DR. ARTHUR HOLMES, assistant professor of psychology at the University of Pennsylvania, has accepted the post of dean of the faculties of Pennsylvania State College.

DR. WILHELM WUNDT, professor of philosophy at Leipzig, has been made a knight of the Prussian order "pour le mérite."

THE
PSYCHOLOGICAL BULLETIN

GENERAL REVIEWS AND SUMMARIES

PSYCHOPHYSICAL MEASUREMENT METHODS

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Blondel and Rey (1) raise the question as to the dependence of the threshold for light stimuli on the intensity and duration of the stimulus. They come to the conclusion that Bloch's law which makes the threshold depend on the quantity of illumination (the product of optical energy times duration) holds for stimuli of comparatively high intensity only. The following argument is of considerable theoretical interest to psychophysics. Ribi  re made experiments on the distance inside of which a light of given intensity but variable duration could be seen. It was found that this distance increased constantly with duration of the light stimulus between the limits 0.25 to 1.78 seconds without attaining the distance at which a constant light could be seen. From this it follows that the so-called minimum stimulation is well defined only with reference to a certain duration. The absolute minimum stimulation would be the one produced by a liminal stimulus after an infinite duration.

Wm. Brown (2) undertook to write a short text-book for the use of the student of quantitative psychology, which is a wider field than psychophysical investigation. The first chapter contains a presentation of the methods, which is perhaps a little short but presents the methods of constant stimuli and of just perceptible differences in some detail. The reader will be pleased to find a new idea. Brown proposes to apply Pearson's theory of the curves of distribution to the study of psychometric functions. The difficulties of this promising enterprise are by no means small, but they may be overcome.

P. Desroche (3) made observations on the influence of the distance of a constant source of light on the phototropic reactions of *Chlamydomonas Steinii*. The animals were first attracted to one side of a drop by a light placed at a certain distance, and then the drop was turned by 180° so as to attract the animals to the other side. The speed of this movement was determined. In the study of the influence of the distance of the light on the speed, one has to distinguish two cases. If several hundred of these animals are placed in the drop the distance of the light influences their speed in a way closely resembling the law of Fechner. If a single animal is experimented on, one finds that its speed is uniform and does not depend on the distance of the light. If, however, the distance of the light increases, the animal does not move straight towards the light and it indulges in frequent stops. Desroche believes that the similarity of his results with the law of Fechner is the result of the compound influence of the individual movements of the animals which become more irregular the greater the distance of the light.

R. Dodge (4) raises the question whether introspective facts are the only mental reality, or whether there are other real indicators of mental life. Rejecting the first view he welcomes every fact, no matter whether its source is pathology, neurology, introspection, or the observation of animal behavior, as long as it is capable of throwing some light on human psychology. There are certain facts like fatigue, or mental work, which are not accessible to introspection, but which are nevertheless as valid indications of mental facts as any result of introspection. Experimental evidence that certain mental capacities undergo measurable objective changes is as true a psychological fact as anything discovered by introspection. Introspection is a real and important factor in certain fields of work, but is only one among many.

Chas. Henry (5) attempts to apply mathematical methods to the general problems of biology, an enterprise for which he is doubly qualified as the author of a text-book on mathematics, and the director of a physiological laboratory. His problem is to study sensitivity and muscular irritability as dependent on the intensity and duration of the stimulus. He studies particularly the sensations of light produced by a variable optical energy of constant duration and those produced by constant energy of variable duration. He tries to determine the character of this dependence and finds that it is identical with the so-called photographic function, which gives the amount of silver reduced by a variable intensity of light of constant duration. It is likely that the curve of photographic action also gives

the process of nervous excitation produced by a variable optical energy of constant duration. Only a certain part of this curve, however, corresponds to conscious processes; the rest of it, from a certain point of inflection on, represents the course of nervous excitation not accompanied by mental processes. The entire curve is called the psychophysical curve, and the author believes that its nature very likely remains the same for different kinds of sense perception. From this one would have to conclude that the processes produced by different stimulations resemble each other to a high degree.

Studying the excitation of the muscle the author assumes that it is directly proportional to the duration of the effort. The dependence of these two quantities can be expressed in a myophysical law and can be studied by the self-registering ergograph for the total work. The curves obtained in this way closely resemble the curve of sensations. The author then proceeds to show that the form of the functions for the irritability of the senses and the muscles do not differ much from those for the change in the weight of cells placed in a medium where the products of dissimulation accumulate, provided that assimilation diminishes in the course of time. These considerations show the possibility of connecting the psychophysical and myophysical laws with those of physical chemistry and of finding the principles of a general mathematical theory of irritability.

The second part of the book is very curious. The author assumes a certain general principle from which he deduces the laws for the variations in the apparent size of straight lines and the wave-lengths of complementary colors. Short mention is made of my demonstration that the arithmetic mean of a group of observations is the most probable value if these observations are made systematically.

E. Jacobson (6) studied the interference of qualitatively different stimuli. The technique of this kind of experiments is not very well developed and its methodology is still untouched by modern refinements. The author did not feel called upon to comply with the requirements of psychophysical experimentation, and the outcome is that there is hardly one result in his paper that would stand a thorough test.

P. Lasareff (7) studies the influence of the size of the visual field on the threshold of sensations. He represents his results by the formula of Helmholtz who modified the psychophysical formula of Fechner by taking into consideration the illumination of the retina.

W. Reimer (8) studied the history of the notion of intensity with special reference to the applications which this notion has found in

psychology. This historical sketch, however, does not include the most recent researches in this field.

F. H. Safford (9) took up the rather technical question as to the number of decimal places to be retained in the numbers of relative frequency and in the coefficients of the equation of the psychometric functions set up by Lagrange's formula. He concludes that the relative frequencies in my monograph on statistical methods should be cut to three instead of four decimal places, and that the number of figures retained by me in Lagrange's formula is entirely too large. He also criticizes my expression of treating the data without a definite hypothesis about the psychometric functions.

Sanford's variation of the method of just perceptible differences is dealt with in (10). There exists some diversity of opinion as to the real value and significance of this variation. It is shown that it does not change the final outcome of this method and that it has the character of a precaution in so far as it enables us to discover gross mistakes.

My paper (11) is a reply to (9). It is pointed out that Lagrange's formula is merely an artificial construction for the representation of the data of observations, and the coefficients in the equation set up by this formula have no immediate physical significance. If a smaller number of figures is retained in the calculation of the coefficients, the equation does not represent the empirical data at all and becomes useless. The phrase "treating the data without a definite hypothesis on the psychometric functions" merely implies that the hypothesis used for the purpose of computation is so indifferent that one could not possibly mistake it for a final solution of the problem.

A further paper (12) is of indirect importance for the problems of psychophysics. A new definition of the notions of chance and probability is given which is based on the modern theory of classes. It is shown that the notion of logical chance, that is, the relation between the general and the particular, is the only one used for defining the notion of mathematical probability. The calculus of probabilities does not make use of events which are not causally necessitated. This is shown by several examples of events which are the objects of the calculus of probabilities in spite of the fact that there does not exist any doubt as to the causes which necessitate them. The demonstration is carried as far as the deduction of the two fundamental propositions of the calculus of probabilities (the theorem of addition and the theorem of multiplication), because all the

remaining propositions can be deduced from these two by purely logical processes. Psychophysics makes very wide use of the notion of probability in so far as the method of just perceptible differences as well as the method of constant stimuli are built up on this notion. The passing of a judgment under well-defined conditions is regarded as a chance event, and the question naturally arises whether we should favor the idea of these events not being fully determined by their antecedent causes, or whether we should form an idea about them which is more in agreement with the principles of physical science. The paper shows that the use of the calculus of probabilities does not deny the causal connections between events and it is, therefore, advisable to favor the view that the passing of a judgment is an event causally fully determined in spite of the fact that we are at present unable to follow up these connections.

C. A. Willis and the present writer (13) worked out some experimental data on lifted weights. The results show the influence of variations of the standard stimulus on the constants of the psychometric functions. The standard stimuli of 100, 125, 150, 175, 200, 225 grammes were compared with appropriate comparison weights, and the results worked out by the method of constant stimuli. It was found that the constant h decreased constantly with increasing intensity of the comparison stimulus, while c remains more or less constant. These results are in agreement with those obtained in working out the data of acoumetric experiments. No well-pronounced regularity corresponding to the so-called law of Weber was found.

W. Wirth's *Psychophysik* (14) is doubtlessly the most significant publication of the year. The book is divided into two parts, the first of which contains the mathematical methods, and the second the experimental arrangements used in psychophysical investigations. It is not possible to give a full statement of the contents of this book, and we shall call attention to two significant facts only. The first is that Wirth defines psychophysics so as to let it comprise all the methods of experimental psychology. In this sense one may say that the book contains a new program for psychophysical investigation, and it cannot be doubted that the majority of workers in this field will welcome this new definition of psychophysics. The next observation refers to Wirth's treatment of the so-called psychophysical methods. He recognizes one genuine psychophysical method only, namely, the one based on the notion of the psychometric functions, the theory of which he himself has cultivated with great success. The old methods of psychophysical measurement are mentioned on

account of their historical interest and because they frequently enable one to find a rough and ready result, the exact determination of which would require a considerable amount of work. We lastly mention as significant the fact that the book appeared as part of a text-book on the methods of physiology, thereby procuring to psychophysics the standing of a recognized auxiliary science of physiology.¹

Wirth's paper (15) contains a criticism of the present writer's treatment of the method of just perceptible differences and of G. F. Lipp's use of the equality judgments. He emphasizes the hypothetical nature of the threshold, and insists that it cannot be defined in terms of the result of the method of just perceptible differences. He furthermore tries to show that the result of the method of just perceptible differences does not coincide with that of the method of constant stimuli unless one introduces some special hypothesis in regard to the nature of the psychometric functions. The appendix of the paper contains an interesting discussion of one of the series of my experiments on lifted weights. He calculates the arithmetical means of the limits and of their standard deviations in groups of 50 experiments, and tries to show that a definite effect of practice can be found in these results. It would not seem very surprising that such an influence of practice should have taken place, but it is doubtful whether Wirth's numbers definitely establish the existence of this factor.

REFERENCES

1. BLONDEL, A. and REY, J. Sur la perception des lumières brèves à la limite de leur portée. *C. R. de l'Académie des Sciences*, 1911, 153, 54-56.
2. BROWN, WILLIAM. *The Essentials of Mental Measurement*. Cambridge: University Press, 1911. Pp. 154.
3. DESROCHE, P. Sur une interprétation de la loi de Weber-Fechner. *C. R. de la Société de Biologie*, 1911, 70, 571-572.
4. DODGE, R. The Theory and Limitations of Introspection. *Amer. J. of Psychol.*, 1912, 23, 214-229.
5. HENRY, CHARLES. *Sensation et énergie*. Paris, 1911. Pp. 296.
6. JACOBSON, E. Experiments on the Inhibition of Sensations. *PSYCHOL. REV.*, 1911, 18, 24-53.
7. LASAREFF, P. Studien über das Weber-Fechner'sche Gesetz. *Arch. f. d. ges. Physiol.* (Pflüger), 1911, 142, 235-240.
8. REIMER, W. Der Intensitätsbegriff in der Psychologie. *Vjsch. f. wiss. Phil.*, 1911, 35, 277-339.
9. SAFFORD, F. H. Precision of Measurement Applied to Psychometric Functions. *Amer. J. of Psychol.*, 1911, 22, 94-98.
10. URBAN, F. M. Eine Bemerkung über die Methode der ebenmerklichen Unterschiede. *Arch. f. d. ges. Psychol.*, 1911, 20, 45-51.

¹ See special review on p. 245, below.

11. URBAN, F. M. A Reply to Professor Safford. *Amer. J. of Psychol.*, 1911, 22, 298-303.
12. URBAN, F. M. Ueber den Begriff der mathematischen Wahrscheinlichkeit. *Vjsch. f. wiss. Phil.*, 1911, 35, 1-49; 145-185.
13. WILLIS, C. A. and URBAN, F. M. Ein Beitrag zur Kenntniss der psychometrischen Funktionen im Gebiete der Gewichtsempfindungen. *Arch. f. d. ges. Psychol.*, 1911, 22, 40-46.
14. WIRTH, W. *Psychophysik. Darstellung der Methoden der experimentellen Psychologie*. Leipzig, 1912. Pp. 522.
15. WIRTH, W. Zur erkenntnistheoretischen und mathematischen Begründung der Massmethoden für die Unterschiedsschwelle. *Arch. f. d. ges. Psychol.*, 1911, 20, 52-100.

TESTS

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The field of tests has broadened out so that it now includes several types of investigation which do not in all cases closely resemble one another. The first group of investigations which may be regarded as being included in this topic deal with the development of methods of [testing single mental processes. The purpose of these investigations is to determine the best method of procedure to be followed. There have thus far been published under the direction of the Committee on Tests of the American Psychological Association reports by Angell (2) upon Mental Imagery; by Pillsbury (29) on Tests of the Intensity of Sound; by Seashore (31) on Pitch Discrimination; by Woodworth and Wells (42) on Association; and by Yerkes and Watson (43) on Vision in Animals.

Angell describes the methods which have been used to test imagery, classifying them into objective and subjective methods. The objective methods in general, which exclude introspection, are held to be unreliable as methods of determining the type of mental imagery. The author chooses the tests which he has found to be most reliable and forms two series, adding suggestions regarding the grading of the results. Pillsbury criticises in detail the methods for testing intensity of sound, and selects the telephone as the one to be most highly recommended from the point of view of accuracy, but recommends the tuning fork from the point of view of convenience. Seashore not only recommends the most reliable apparatus for testing pitch discrimination, but also goes into some detail in giving directions for the conduct of the tests and interpretation of the results, and discusses their practical application. Woodworth and

Wells have made an elaborate study of methods of testing association, for the purpose not so much of comparing the various methods which are in use as of working out a standard method of each type of testing, and of describing the methods in sufficient detail so that they may be followed by other investigators. Yerkes and Watson give a very detailed description of the methods and apparatus which are used for testing the light and color vision, and the size, form, and distance perception in animals, and recommend the most reliable forms. A short article by Kirkpatrick (20) consists mainly in the criticism of the Betts test for the vividness of imagery. The study of Whitley (40) was undertaken for the purpose of investigating the reliability of certain of the Columbia tests of simple mental processes, and other tests which are added to these. As a result of the investigation, certain of the tests were found to be more reliable than others and were selected for recommendation. The investigation concludes with a study of the practice curve.

The second group of tests to be considered deals with single mental processes or groups of the mental processes for the purpose of determining their value as a means of diagnosis. The diagnosis may be of general capacity or general ability or of mental derangement or retardation, or of some special condition such as fatigue.

Healy and Fernald (17) have collected a series of tests which they have found useful in diagnosing the mental capacity of children in the Juvenile Court. The same tests are applied to the children of all ages, and are for the purpose not of rating the children quantitatively, but of classifying them into one of a number of groups, such as superior mental ability, average mental ability, dull, etc. The aim in choosing the tests was so far as possible to bring out the capacity of the child for dealing with practical situations of life rather than for meeting the demand of the school room.

Another group of tests has been tried out by Abelson (1) upon a group of backward children, of a mean age of 11. The tests dealt partly with simple motor or perceptual processes and partly with higher mental processes. The author found that the tests on the whole correlated well with the teacher's estimates, but that a single test taken alone was not reliable. The tests of higher mental processes did not seem to be better than the tests of the simpler processes.

Descoeudres (11) investigated various tests upon a very small group of fourteen backward children. The main purpose was to compare the reliability of the different tests used, and this was done

by finding the correlation between the rank of the children in each individual test, and in the average of all the tests together. The author concluded that tests of reasoning were the best, tests of imagination next, and tests of attention and memory of the least value.

In order to determine whether certain criticisms which have been made of the value of the teacher's estimate are well founded, Gilby (15) and Waite (38) compared the order in which school children are placed in the estimate of the teacher, and the order in which they are placed by their grades on examination or in their class work. On the basis of the correlation which was found between these two methods of ranking, both investigators concluded that the teacher's estimate of the children was as reliable as their school grades. A comparison of the results of testing memory, and the ability to apprehend abstract relations by giving opposites to such words as "but" and "although" with the rank in class in logic and psychology was made by Marvin (24). The author found that there was a correlation between the standing in class and in the tests, and that the correlation between memory and psychology was somewhat closer than that between memory and logic.

Immediate memory was used as a test of fatigue in school children by Winch (41). He investigated the relative improvement in mechanical memory which was made by a group of children who were tested in the morning, and a parallel group tested in the afternoon. The average difference was found to be small, amounting to 2 per cent. in one case and to 5 per cent. in the other. The result may be interpreted as indicating either that immediate memory is not a good test for fatigue, or that there was not much fatigue present in the case of these children.

The use of Kraepelin's reckoning test in psychiatry is recommended in the article by Maloney (22). The author describes the test and the manner in which it may be used for the purpose of diagnosing mental derangement.

The same general purpose which underlies the tests of the preceding group underlies also another group of tests, which are arranged in series of ascending difficulty. The series may contain tests which correspond to the different ages as do the Binet tests, or may merely be arranged in groups as are the De Sanctis tests.

The Binet tests have received much attention during the past year, and have been subjected to many experiments. These experiments have been described for the most part in the article by Huey

(19). It will not be worth while to duplicate either his reviews or his bibliography. The reader is therefore referred to Huey's article for the literature upon the Binet tests. A few articles that Huey has not referred to may be mentioned.

Descoedres (12) has attempted to determine how accurately the Binet scale distinguishes bright from dull pupils, and how uniform it is throughout its range. The 1908 series was used. The tests were applied to two bright and two dull pupils (each pair consisting of a boy and a girl) from each of six classes, the ages ranging from $7\frac{1}{2}$ to 13 years. The author found that of all the correct responses which were made the bright pupils made 57 per cent. and the dull pupils 43 per cent. Some of the tests, however, distinguished the bright from the dull pupils much better than others. The author agrees with the other investigators who have used the Binet scale, that the tests for the early years are too easy, and the tests for the later years too difficult. Gifford and Goddard (14) used the Binet scale in the examination of defective children in the Juvenile Court, and found more or less mental retardation in every case but one out of 100 children. Hill and Goddard (18) tested fifty delinquent girls by means of the Binet scale and concluded that all but four were mentally defective. McDonald (21) says in a communication that he regards the Binet scale as of value in testing senile dementia, paresis and moral imbecility.

An article by De Sanctis (10) discusses the theoretical basis for test series and reproduces his own scale, which has been described elsewhere by Goddard and Whipple. De Sanctis distinguishes two levels of mental processes, the level of lower and higher ideation. Development proceeds from one level of intelligence to another, and hence series of tests may be devised to determine the level of experience or the maturity of individuals. De Sanctis does not accept the hypothesis, however, that intellectual defect in defective children and dementals corresponds "to the degrees of intellectual development in the ages of growth."

An entirely different type of test has to do with accomplishment rather than with native ability, and seeks to measure the result of educational effort. One form of test of this sort consists in standardized tests in particular school subjects. Pearson (28) describes a method by which the results of work in spelling may be scientifically tested. His method, however, is not standardized in the sense that the results found by different investigators may be compared. Courtis (9) describes briefly his elaborately standardized tests in

arithmetic and discusses the need of such tests for purposes of comparison and of guidance in teaching. Courtis (8) gives in another article illustrations of tests in writing, arithmetic, spelling, history and English in order to show the value and possibility of standardized tests. Bliss (6) describes a method, which he has used for some years, of testing deficiency in English teaching by means of the "reproduction story." A story, according to this method, is read to the pupils, which they are then required to reproduce. Though not permitting of strictly comparable results on account of the lack of a standardized method of grading, the author believes the test to be of value as an aid in supervision.

Thorndike (35, 36) describes the method of construction of a scale which is intended to serve as a means for grading in English composition. The purpose is to make comparable grading of compositions by different persons and in different places, and to enable the investigator to determine not merely the relative rank of different specimens, but also the amount of difference in excellence between them.

Ayers (3) describes the derivation of a scale for the measurement of the legibility of handwriting and submits the scale which was constructed on a basis of the investigation. The scale was constructed upon the basis of the time taken by ten investigators to read a large number of samples of writing of school children. Freeman (13) describes the procedure by which the teacher or supervisor may test the legibility and speed of writing in order to obtain standardized results.

School and college grades may also be regarded as tests. Smith (32) and Steele (33) urge the adoption of systems of grading which are based upon the normal distribution of traits. Steele suggests that teachers be led to see the importance of a rational system by a demonstration of the lack of uniformity in their own marking, and gives an illustration of the means by which this may be done.

Strayer (34), Ayers (4), and Thorndike (37) discuss in general the importance of quantitative measurements of the results of educational effort. Gulick (16) discusses the same topic in relation to school hygiene.

Another purpose for which tests are employed is the characterization of an individual in order to determine his relationship to other individuals or to a norm in respect to his general mental type. Margis (23) describes various more or less unsatisfactory methods by which this determination may be made—the intuitive-descriptive method,

the classification method, etc.,—and describes in some detail the analytic method as advocated by Stern and employed in the Institut für Angewandte Psychologie und Psychologische Sammelforschung. This method consists of a thorough investigation of the individual by means of a carefully worked out questionnaire.

Münsterberg (26) discusses with some illustrations the use of tests in vocational guidance, and Seashore (30) describes an elaborate method for determining the qualification for singing possessed by an individual.

The theoretical principles which underlie mental tests are discussed by Betz (5) and Brown (7). Both of these authors treat at some length the mathematical principles by which correlation may be determined and give particular attention to the work of Galton, Pearson and Spearman in this connection. They also discuss critically the investigations which have been carried on and the methods which are employed. Betz concludes that it is futile to attempt to determine general intelligence, but holds that the mental processes are more specialized than such a concept would assume. Brown concludes by describing the results of his investigations into the correlation of various mental processes. He concludes that certain tests, as that of Ebbinghaus, correlate better with general intelligence than others, but that there is much less correlation between processes which we regard as similar than we should expect.

Weiss (39) suggests a new method of ranking individuals by comparing the performance of the various members of a group with the average performance of the group. The method in short is to determine the deviation of a particular individual from the mean of the group to which he belongs.

Myers (27) in a critical article points out the dangers of the unsuccessful use of mental tests, or of hasty and ill-advised conclusions drawn from their interpretation.

REFERENCES

1. ABELSON, A. R. The Measurement of Mental Ability of "Backward" Children. *Brit. J. of Psychol.*, 1911, 4, 268-314.
2. ANGELL, J. R. Methods for the Determination of Mental Imagery. *PSYCHOL. MONOG.*, 1910, 13 (53), 61-108.
3. AYERS, L. P. *A Scale for Measuring the Quality of Handwriting of School Children*. New York, 1912. Dept. of Child Hygiene, Russel Sage Foundation.
4. AYERS, L. P. Measuring Educational Processes through Educational Results. *Sch. Rev.*, 1912, 20, 300.
5. BETZ, W. Ueber Korrelation. *Beihefte zur Zsch. f. angew. Psychol. u. psychol. Sammelforsch.*, 3, 1911.

6. BLISS, D. C. Some Results of Standard Tests. *Psychol. Clinic*, 1912, 6, 1.
7. BROWN, WM. *The Essentials of Mental Measurement*. Camb. Univ. Press, 1911. Pp. vii+154.
8. COURTIS, S. A. The Comparative Test as an Educational Ruler. *Amer. Educ.*, 1911, 13-18.
9. COURTIS, S. A. Standard Tests in Arithmetic. *J. of Educ. Psychol.*, 1911, 2, 272.
10. DE SANCTIS, S. Mental Development and the Measurement of the Level of Intelligence. *J. of Educ. Psychol.*, 1911, 2, 498-507.
11. DESCOEUDRES, A. Exploration de quelques tests d'intelligence chez des enfants anormaux et arriérés. *Arch. de Psychol.*, 1911, 11, 351-375.
12. DESCOEUDRES, A. Les tests de Binet et Simon et leur valeur scolaire. *Arch. de Psychol.*, 1911, 11, 331-350.
13. FREEMAN, F. N. Problems and Methods of Investigation in Handwriting. *J. of Educ. Psychol.*, 1912, 3, 181-190.
14. GIFFORD, MRS. E. G. and GODDARD, H. H. Defective Children in the Juvenile Court. *Training School*, 1912, 9, 132-134.
15. GILBY, W. H. and PEARSON, K. On the Significance of the Teacher's Appreciation of General Intelligence. *Biometrika*, 1911, 8, 94-108.
16. GULICK, L. H. Measurements as Applied to School Hygiene. *J. of Educ. Psychol.*, 1911, 2, 301.
17. HEALY, W. and FERNALD, G. M. Tests for Practical Mental Classification. *PSYCHOL. MONOG.*, 1911, 13. Pp. 53.
18. HILL, H. F. and GODDARD, H. H. Delinquent Girls Tested by the Binet Scale. *Training School*, 1911, 8, 50-56.
19. HUEY, E. B. The Present Status of the Binet Scale for Measuring Intelligence. *PSYCHOL. BULL.*, 1912, 9, 160-168.
20. KIRKPATRICK, E. A. Tests for Class Purposes and for Research Purposes. *J. of Educ. Psychol.*, 1911, 2, 336-338.
21. McDONALD, J. B. The Binet Tests in a Hospital for the Insane. *Training School*, 1910, 7, 250-251.
22. MALONEY, W. J. On the Reckoning Test and its Uses in Psychiatry. *Rev. of Neur. and Psychiat.*, 1911, 9, 366-377.
23. MARGIS, P. Das Problem und die Methoden der Psychographie. *Zsch. f. angew. Psychol.*, 1911, 5, 409-451.
24. MARVIN, W. T. A Comparison of Some Mental Measurements with the Standing of Students in Two College Courses. *Training School*, 1911, 8, 66-69.
25. MEUMANN, E. Ueber eine neue Methode der Intelligenzprüfung und über den Wert der Kombinationsmethode. *Zsch. f. päd. Psychol. u. exper. Päd.*, 1912, 13, 161.
26. MÜNSTERBERG, H. Experimentelle Psychologie und Berufswahl. *Zsch. f. päd. Psychol. u. exper. Päd.*, 1912, 13, 1.
27. MYERS, C. S. The Pitfalls of "Mental Tests." *Brit. Med. J.*, 1911, 1, 195-197.
28. PEARSON, H. C. The Scientific Study of the Teaching of Spelling. *J. of Educ. Psychol.*, 1911, 2, 241.
29. PILLSBURY, W. B. Methods for the Determination of the Intensity of Sound. *PSYCHOL. MONOG.*, 1910, 13 (53), 1-20.
30. SEASHORE, C. E. The Measure of a Singer. *Science*, 1912, 35, 201.
31. SEASHORE, C. E. The Measurement of Pitch Determination. *PSYCHOL. MONOG.*, 1910, 13 (53), 21-60.

32. SMITH, A. G. A Rational College Marking System. *J. of Educ. Psychol.*, 1911, 2, 383-393.
33. STEELE, A. G. Training Teachers to Grade. *Ped. Sem.*, 1911, 18, 523-532.
34. STRAYER, G. C. Measuring Results in Education. *J. of Educ. Psychol.*, 1911, 2, 3.
35. THORNDIKE, E. L. A Scale for Merit in English Writing by Young People. *J. of Educ. Psychol.*, 1911, 2, 361-368.
36. THORNDIKE, E. L. A Method for Grading Excellence in Composition. *Science*, 1911, 33, 935-938.
37. THORNDIKE, E. L. The Measurement of Educational Products. *School Review*, 1912, 20, 289.
38. WAITE, H. Estimation of the General Intelligence of School Children. *Biometrika*, 1911, 8, 79-93.
39. WEISS, A. P. On Methods of Mental Measurements, Especially in School and College. *J. of Educ. Psychol.*, 1911, 2, 555-563.
40. WHITLEY, M. J. *An Empirical Study of Certain Tests for Individual Differences.* (*Arch. of Psychol.*, No. 19.) New York: The Science Press, 1911. Pp. iii+146.
41. WINCH, W. H. Mental Fatigue in Day School Children as Measured by Immediate Memory. *J. of Educ. Psychol.*, 1912, 3, 18-28; 75-82.
42. WOODWORTH, R. S. and WELLS, F. L. *Association Tests.* PSYCHOL. MONOG., 1911, 13 (57). Pp. 85.
43. YERKES, R. M. and WATSON, J. B. *Methods of Studying Vision in Animals.* Behavior Monographs, 1911, 1, No. 2. Pp. 90.

CORRELATION

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The publication during 1911-12 of many important papers on correlation, its interpretation, methods and applications, affords an unusual opportunity to introduce a general review on this topic. Contributions by Pearson, Hart and Spearman, and Winch, if they stand the test of criticism, will remain fundamental in this field. Betz with his monograph *Über Korrelation* (4) publishes a bibliography of 102 titles, most of which are dated within the last ten years. He presents a complete and critical treatment of the subject, devoting chapters to the methods for determining correlation, the correlation investigations of psychological problems, the recent publications of the Galton Eugenics Laboratory and the correlation work done upon ability in mathematics. In the chapter on methods, besides explaining Pearson's fundamental product-moment formula he gives Shepard's formula for correction of σ if the distribution is not symmetrical. He also devotes sections to non-linear correlations, the probable errors of the coefficients, correlations by rank, the four-fold method,

multiple correlation, Spearman's correction formulæ, and spurious correlation, giving briefly the standard treatments of each of these topics. The criticism of Spearman's correction formula by Pearson and Brown is reviewed and approved. It is contended that the assumption that the errors of observation in the different series are not correlated does not hold in specific cases, Brown claiming .66 correlation in one case. It should not be expected to hold under the usual experimental conditions. This difficulty is not avoided in Spearman's modification of his formula. Furthermore Betz believes that it is not clear whether Spearman would not eliminate gross true fluctuations of activity along with slight chance errors of observation.

The high coefficients in sensory discrimination obtained by Spearman are more likely to show the ease in which the different children followed the instructions. The evidence of a central factor is not convincing. The "hierarchical" ordering of abilities might be produced by a general cause of error. The evidence at present is against a general pronounced, easily apparent intelligence. Were it not for our prejudice, we should be surprised that the correlations of intellectual activities are so high rather than that they are not higher.

The eugenics researches are most important indirectly to psychology in forming a general point of view because they show that factors like alcohol and housing which were thought to be of enormous importance are found to be of minimal effect. This is at present determined for only a few characteristics but it is very conceivable that it holds generally.

In conclusion Betz emphasizes that correlation alone does not demonstrate a functional connection. Moreover, if changing one variable necessarily changes the second it is not shown that the converse is true; not all functional connections are reversible. An inventory of correlations cannot disclose psychological secrets unless supplemented by an understanding of mental facts. Correlations serve two purposes in psychology: (1) mass-studies, in which traits are described in popular terms, to aid in the educational or social description of groups; (2) the discovery of functional connections by using the greatest care in analysis and experiment with small groups. In another brief paper (5) Betz shows with actual examples how to prepare a correlation table, compute the product-moment coefficient, the correlation ratio and test for linearity.

Pearson (20) grasps and sets forth correlation and contingency in their ultimate significance. His wider outlook regards the universe

as "a complex of contingent, not causally linked phenomena." "The aim of science ceases to be the discovery of 'cause' and 'effect'; in order to predict future experience it seeks out the phenomena which are most highly correlated. . . . From this standpoint it finds no distinction in kind but only in degree between the data, method of treatment, or the resulting 'laws' of chemical, physical, biological, or sociological investigations. . . . No phenomena are causal; all phenomena are contingent, and the problem before us is to measure the degree of this contingency, which we have seen lies between the *zero* of independence and the unity of causation." Pearson is to be thanked for clearly showing how easy it is and how useful to science to conceive causation as a specific limited form of contingency. For understanding the assumptions underlying the correlation ratio and the coefficient of contingency this new chapter is the clearest brief statement to be found anywhere. Students of correlation will undoubtedly get much joy out of the statement of this leader that a contingency table is "the numerical syllogism of observational science, which replaces for all its purposes the barren syllogism of the old Aristotelian logic. We do not say, 'Some *B* is *A*,' but we state numerically how much of each class of *B* is associated with each category of *A*." Pearson promises that much is to be added to the chapters on living forms when these appear in Part II. of the new edition.

Pearson (21) derives a formula for determining whether small values of the correlation ratio are significant. He also contributes further (22) to the discussion of the Law of Ancestral Heredity and reiterates his former conclusions that "the theory of multiple correlation is the natural manner in which to approach the theory of ancestral inheritance." "The fact that Mendelian gametic correlations approach in some respects those found by observation on populations, is not a justification of Mendelism."

An astonishing paper on the interpretation of psychological correlations, if we may accept its basic presupposition, is that which has appeared very recently under the joint authorship of Spearman and Hart (15). The article claims to demonstrate conclusively by means of a correlation criterion which they propose as crucial that "correlation arises through performances, however different, depending partly on a 'General Common Factor.'" They offer also a new interpretation of this source of correlation which in one form or another has been the favorite explanation of Spearman for some time. This view, called "unifocal," they contrast with the "non-focal"

view of universal independence of mental processes drawn from Thorndike's earlier writings, and Thorndike's later view of levels as well as those other "multifocal" interpretations which attribute correlation to correspondence of type or faculty. "Every performance depends, not only on this General Factor, but also in varying degree on a factor specific to itself and all very similar performances." The General Factor is not any special sort of process, such as "intelligence" or "synthetic power," nor is it to be identified with attention. It is "some common fund of energy," characterized on the mental side as "intellective energy." On the physiological side every intellectual act involves "both the specific activity of a particular system of cortical neurons, and also the general energy of the whole cortex." Every such performance, therefore, inhibits quite different simultaneous ones, any kind of non-mechanical process competes for this fund of energy. As evidence of this conception the authors point to "the larger correlations usually produced by the operations demanding attention, the reduction of correlation as the performances tend to become mechanical, and the large correlations shown by even the simplest performances of the mentally defective." The recent "surprising regeneration of 'mental tests'" they attribute to "both their purpose and method having been transformed in accordance with the theory of a General Factor."

The proposed correlation criterion which the authors suggest as the conclusive mathematical test of their "unifocal" theory is too complex to set forth here. The authors believe that it is decidedly better than the "hierarchy" of coefficients heretofore used. Applying this criterion to the results of fourteen different series of correlation experiments by men of all the different faiths, they find the surprising result that in every case the correlations are $+ .73$ or over and the median almost complete $+ 1.00$, the value demanded by their theory and as far as possible from the values of 0 and -1.00 which they contend is demanded by the other theories. They also use their criterion to controvert Brown's criticism of their "hierarchical" arrangements of coefficients. The paper disclaims any opposition to Thorndike's work on specific abilities, the correlations of which may be superposed upon correlations of a more general character. "Still less is it in opposition to his work on 'formal training.' . . . Variation of training, within normal limits, appears to have no appreciable influence on the General Factor, but only on the specific ones." Spearman (24) presents a new form of his correction formula for eliminating chance errors of observation, which had been published

also in the *Brit. J. of Psychol.*, 1910, 3, 271-295. It is based on dividing the measurements of each individual into two or more groups in such a way that the average of each group may be considered alike except for these chance observational variations. Spearman (25) also replies to the criticism of Brown and Betz concerning his former correction formulæ. He contends that only computation can determine how far chance errors are to be guarded against. The careful arrangement of the research, which his critics advise, is insufficient. Brown's mathematical and empirical criticisms, he claims, are both faulty. Betz (6) answers this reply of Spearman and remains unconvinced about the usefulness to psychology of Spearman's formulæ for eliminating accidental errors.

Abelson's research (1), carried out under the direction of Spearman, afforded part of the data on which the interpretation of the General Factor was based. Nine specially devised tests were tried on 88 girls and 43 boys from London schools for defectives, 10-12 of each sex of the highest grade pupils in each of eight schools. The coefficients were computed by Spearman's "foot-rule" method for the boys and girls separately in each school and then averaged. The tests were repeated two or more times until a reliability of .70 or more was reached. Tables give the intercorrelations of each test with the others and with the average of the others. Corrections for differences in age and for chance errors he has calculated in part and estimates that they will not affect his conclusions. The tests may be regarded "as almost independent and about equally accurate measurements of 'general ability.'" On this assumption Spearman devised formulæ for estimating how much any number of tests pooled together will differ from the result of an infinite number of tests pooled. Pooling tests very greatly increases their trustworthiness in estimating "general ability." The correlation between all the tests pooled together and estimates of "practical intelligence" was .60 for the girls and .56 for the boys.

In a paper outlined before the joint meeting of the British Psychological Society, the Mind Association, and the Aristotelian Society, Winch (29) with hesitation sets forth a "modified faculty doctrine," which is based mainly on determining the functions thus to be regarded as associated by discovering their correlations and measuring the transfer of training under improved methods. He emphasizes especially his method of "steadyding" a group by repeating the tests until succeeding tests correlate highly. This should be done before one kind of test is correlated with another. It is to be remembered,

however, that "high correlation sets us a problem of connection. It does not *ipso facto* enable us to conclude that a relation of interdependence exists." Low correlation between traits measured for groups of individuals may even go with functional connection of the two traits in the same individual. "Brown's capacity may be big in one direction and small in another *as compared with that of Smith and Robinson*, but an alteration in one of his functions may produce some alteration in the other. To find the connection of functions within the same mind, would it not be best to get a number of measures for the same individual and correlate these?" In determining whether training of one function transfers, we should use his method of "equal groups," chosen after "steadyding." "The mental functions thus connected will, I believe, give 'groupings' or 'faculties' rather unlike those of early psychology." In order to justify formal training "we should need to show that, by the formal training of function α we can produce a transferred improvement in function β which we could not, with equal work, produce by training function β itself," or that "that function may not be accessible to direct attack."

Woodworth (30) introduces a new quick method of computing r which he believes is "worthy to be regarded as one of the best abridged or 'foot-rule' methods." He also develops simplified formulæ for computing r , the average correlation within any number of tests, and for the Spearman correction for attenuation, when the original measurements have been reduced to terms of the standard or the average deviation. He advocates this method of reduction whenever several tests on the same individuals are either to be combined or correlated. It is the only way to preserve the refinement of the original measurements. The reduction of the measurements also allows one to show the success of each individual in relation to the tests taken as a whole. With nine tests for logical relationships applied to thirteen individuals, he finds that those who ranked high were more consistent than those who ranked low. The Pearson coefficient between standing and consistence was .72. He suggests that the standard variability of the average standing of the individuals is a new measure of the agreement of several tests which has certain advantages over the Av. r . Woodworth and Wells (31) utilize the method of correlating the average standing of each subject with his standing in each test, after reducing the tests to equivalence, and thus determine the relative value of certain association tests.

Yule (32) gives us a text-book on statistics which devotes eight

chapters to association and correlation methods and is adapted to those who have a limited knowledge of mathematics. Written primarily for students of economics and vital statistics, it aims also to be of use to biologists and others. The text is the most comprehensive simple treatment of correlation to be found. Two of the formulæ suggested in the text—the Coefficient of Association and the Correction Coefficient for a two- \times two-fold table are emphatically attacked by Heron (16) both as to their derivation and the results obtained by their use. Stern (26) devotes a chapter to the statistical methods of correlation and two other brief chapters to the concept of correlation and the aims of research in this line. Brown's book on *Mental Measurement* (8) is written primarily for the psychologist, who will find it perhaps, the handiest manual of the recent correlation formulæ. It follows Pearson closely.¹

In two researches the teacher's estimate of intelligence is empirically defended from Yule's belief "that unless they are very carefully controlled, the teacher's judgments are *relatively* as well as absolutely valueless." Gilby's study (14) is authoritatively prepared with the assistance of Pearson. The judgments of 36 teachers in eight schools on 1,725 boys in which they graded intelligence on the scale of five categories defined by Pearson, it traced in interrelations with order in examination, percentage of marks, age, standard, school, and clothing, the latter defined in five grades. Correlation of general intelligence and order in examination for constant age and constant standard was .671. The places in marks and examination were settled by headmasters independently of the class teachers. The correlation between clothing and intelligence for constant age and constant standard is .22. "There can we think be little doubt that the evidence of clothing is roughly a measure of home conditions." There is very little relation between age and order in class or age and intelligence. The other research by Waite (27) presents similar results. "No single psychological test or complex of tests is in the least likely to replace our present method of judging general efficiency for public or other service." The correlation between age and intelligence in the same "form" is either negligible or negative. In both papers the work is very carefully done from the statistical point of view, full correlation tables are given, various methods tried, and linearity estimated.

Correlation has been used extensively by Whitley (28) as a method for evaluating various tests for similar functions and for determining

¹ See special review in this BULLETIN, 1912, 9, 125-126.

the relationship of various scores for tests involving practice. About 45 different tests were repeated on from three to seven subjects and occasionally checked by a larger group. The tests, grouped around each of six types (association, memory, perception, discrimination, discrimination and motor, motor), were each correlated with the average records in that group, the test showing the highest correlation being regarded as the best representative of that type, although it might be less valuable from other points of view. In the second part of the study perhaps the most striking result is the high negative correlation between the position at the start and either gross or percentile gain with practice. Five of the ten coefficients are over $-.90$. "Individuals with low standing can and do improve the most, judging objectively." The relationship of the position at the start with the average of the whole series is closer than between it and the position at the finish. "Fewer tests each administered oftener would give a truer estimate of an individual and a better basis for comparison and correlation." "The criticism that giving only a few trials measures not the mental process supposedly tested but merely adaptability to strange conditions such as apparatus, instructions, working for speed, and the particular requirements of the test is seldom of weight."

The first published results of the Anthropometric Laboratory at Oxford (23) include 16 physical measurements and one mental test, McDougall's spot pattern. Twenty correlations are given for the physical measurements for each of the ages from 18 to 22, with 95 to 330 cases at the different ages. The table is thus the most complete for any of the college data on the subject. The correlations between the possession of a scholarship or exhibition and the spot pattern test which McDougall thinks measures concentration is small, $.22$ on the average for all grade groups, and about the same for this test and "class in final schools."

In a preliminary report of an important study to be published by the Bureau of Education Baldwin (2), as the result of successive measurements on the same group of 350 boys and 435 girls taken for periods of from 3 to $11\frac{1}{2}$ years indicates that there are different correlations for growth in height and weight for those above the median than for those below. Those above begin and end their various periods of acceleration and retardation earlier. Curves for 52 individuals show that correlations in weight do not follow those for height in detail.

Boyce (7) correlates the estimates of 27 superintendents and

principals as to the rank of their high school teachers in various traits bearing on teaching efficiency, and finds that general merit had little or no relation to sex, to general appearance .36, to instructional skill .90, to stimulation of pupils .85, to stimulation of individuals .85. These three, with intellectual capacity .71 and discipline .67, are the qualities deemed most important. Descoeudres (11) gives correlations between 15 tests (six taken from the Binet series) and her estimate of intelligence for 14 deficient children from 6 to 14 years. For the separate tests the coefficients run from .509 to .878. The correlation with the average rank in all is .991. No correction was made for differences in age. Norsworthy (19) finds the correlations of the rate of learning German-English word associations with immediate memory to be .41 and with memory after 30 days to be .50; between immediate and this later memory .60. The tests were on 83 college students and disprove the theory of "easy come, easy go," at least for this group. Lobsein (17) and Erler (12) get opposed results on the problem whether memory for numbers correlates with ability in the simple arithmetical operations. Busemann's and Bell's aims are shown in the title of their papers (9) and (3). Lipmann's paper (18) is a review of that field. Cohn and Dieffenbacher's correlation results (10) are probably affected by neglect of age differences in their groups. Forsyth (13) found slight correlation between ages and grades with college students.

REFERENCES

1. ABELSON, A. R. The Measurement of Mental Ability of "Backward" Children. *Brit. J. of Psychol.*, 1911, 4, 315-341.
2. BALDWIN, B. T. Individual Differences in the Correlation of Physical Growth of Elementary and High School Pupils. *J. of Educ. Psychol.*, 1911, 2, 150-152.
3. BELL, JULIA. On Pulse and Breathing Rates and their Relation to Stature. *Biometrika*, 8, 232-236.
4. BETZ, W. Über Korrelation. *Zsch. f. angew. Psychol.*, 1911, 5 (Beih. 3).
5. BETZ, W. Rechenbeispiele in Ergänzung zu Beiheft 3, Über Korrelation. *Zsch. f. angew. Psychol.*, 1912, 6, 65-73.
6. BETZ, W. Erwiderung auf den vorstehenden Aufsatz von Spearman. *Zsch. f. angew. Psychol.*, 1912, 6, 77-78.
7. BOYCE, A. C. Qualities of Merit in Secondary School Teachers. *J. of Educ. Psychol.*, 1912, 3, 144-157.
8. BROWN, WILLIAM. *The Essentials of Mental Measurement*. Cambridge University Press, 1911. Pp. vi+154.
9. BUSEMANN, A. Die individuellen Korrelationen zwischen den Leistungen in Gedächtnisexperimente und denen im Unterrichte. *Zsch. f. angew. Psychol.*, 1911, 5, 341-344.
10. COHN, J. and DIEFFENBACHER, J. Untersuchungen über Geschlechts-, Alters-

- und Begabungs-Unterschiede bei Schülern. *Zsch. f. angew. Psychol.*, 1911, 5 (Beih. 2). Pp. vi+214.
11. DESCOEUDRES, ALICE. Exploration de quelques tests d'intelligence chez des enfants anormaux et arriérés. *Arch. de Psychol.*, 1911, 11, 351-375.
 12. ERLER, O. Zahlengedächtnis und Rechenfertigkeit. *Zsch. f. päd. Psychol. u. exper. Päd.*, 1911, 12, 294-295.
 13. FORSYTH, C. H. Correlation between Ages and Grades. *J. of Educ. Psychol.*, 1912, 3, 164.
 14. GILBY, W. H., with the assistance of PEARSON, K. On the Significance of the Teacher's Appreciation of General Intelligence. *Biometrika*, 1911, 8, 94-108.
 15. HART, B. and SPEARMAN, C. General Ability, its Existence and Nature. *Brit. J. of Psychol.*, 1912, 5, 51-84.
 16. HERON, D. The Danger of Certain Formulæ Suggested as Substitutes for the Correlation Coefficient. *Biometrika*, 1911, 8, 109-122.
 17. LOBSEIN, M. Korrelationen zwischen Zahlengedächtnis und Rechenleistung. *Zsch. f. päd. Psychol. u. exper. Päd.*, 1911, 12, 54-60.
 18. LIPMANN, O. Die experimentelle Untersuchung der Rechenfertigkeit. *Zsch. f. angew. Psychol.*, 1911, 5, 389-399.
 19. NORSWORTHY, NAOMI. Acquisition as Related to Retention. *J. of Educ. Psychol.*, 1912, 3, 214-218.
 20. PEARSON, K. *The Grammar of Science*, Part I.—Physical, third edition, revised and enlarged. London: Adam and Charles Black, 1911. Pp. xx+394.
 21. PEARSON, K. On a Correction Needful in the Case of the Correlation Ratio. *Biometrika*, 1911, 8, 254-255.
 22. PEARSON, K. Further Remarks on the Law of Ancestral Heredity. *Biometrika*, 1911, 8, 239-243.
 23. SCHUSTER, E. First Results from the Oxford Anthropometric Laboratory. *Biometrika*, 1911, 8, 40-51.
 24. SPEARMAN, C. Eine neue Korrelationsformel. *Ber. IV. Kongress f. exper. Psychol.*, 1911, 189-191.
 25. SPEARMAN, C. Der Beobachtungsfehler in der Korrelationslehre. *Zsch. f. angew. Psychol.*, 1912, 6, 73-77.
 26. STERN, W. *Die Differentielle in ihren methodischen Grundlagen*. Leipzig: J. A. Barth, 1911. Pp. v+503.
 27. WAITE, H. The Teacher's Estimation of the General Intelligence of School Children. *Biometrika*, 1911, 8, 79-93.
 28. WHITLEY, MARY T. *An Empirical Study of Certain Tests for Individual Differences*. Archives of Psychology, No. 19. New York: The Science Press, 1911. Pp. 146.
 29. WINCH, W. H. The Faculty Doctrine, Correlation, and Educational Theory. *J. of Phil., Psychol., etc.*, 1911, 8, 337-348; 372-384.
 30. WOODWORTH, R. S. Combining the Results of Several Tests: a Study in Statistical Method. *PSYCHOL. REV.*, 1912, 19, 97-123.
 31. WOODWORTH, R. S. and WELLS, F. L. *Association Tests*. PSYCHOL. MONOG., 1911, 8, No. 5. Pp. 85.
 32. YULE, G. UDNY. *An Introduction to the Theory of Statistics*. London: Charles Griffin and Company, 1911. Pp. vi+376.

REACTION TIMES

BY PROFESSOR V. A. C. HENMON

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The studies of the year have been concerned with questions of technique and the effect of direction of attention on reaction time. Breitwieser (1) attacks again the old problem of sensory and motor reactions. Eleven subjects gave an average excess of sensory reaction time to auditory stimuli over motor reaction time of 18σ , the excess ranging from 8.9σ to 44σ . Series were then obtained from two trained subjects without instructions as to direction of attention. Sensory, motor, and normal reactions were introspectively noted and the number reported as motor or sensory was about equal. The times were the same as when the attitudes were voluntarily assumed. In reactions with artificial direction of attention the attempt was made to devise an objective method of insuring the type of attention, motor by varying the resistance of the key, sensory by variation in the clang character of the auditory stimuli. The times for the "induced" sensory and the voluntary sensory reactions are about the same. The times for the induced motor and the voluntary motor are very different and the attitudes in the two cases are different. The voluntary motor reaction involves merely the preparation to react, the voluntary sensory reaction involves both the preparation to observe and to react, the interference between the two adjustments being reflected in the lengthened time for sensory reactions.

Breitwieser next applied the reaction time method to a study of fluctuations of attention, by varying from one to ten seconds the intervals between the ready signal and the stimulus. The results with eighteen subjects, contrary to those reported by Della Valle, showed no rhythmic variations. The number of reactions with each subject is too small and the variability too great for the effects to be shown with any reliability. The most favorable interval for auditory stimuli is apparently 2-3 secs. and for visual stimuli 3-4 secs. Detailed studies with two trained subjects showed considerable regularity as to favorable and unfavorable intervals, but there was no evidence of rhythmic fluctuations in the reaction times.

The last chapter is concerned with the effect of varying the resistance of the reacting key. The times are lengthened progressively as the resistance is increased, hence the necessity of indicating the resistance of the key when the downward pressure type of move-

ment is used. The time of reaction with the release type of movement is independent of the resistance. The excess of force expended varies independently of the resistance and tends to decrease with practice.

The purpose of Grassi's (3) experiments was to determine the effect of change in the direction of attention on sensory reactions to tactual stimuli of constant intensity. Comparisons were made between reactions (1) when the area stimulated is constant, (2) when the area is varied with each stimulation—points on the left side of the body, face, forearm, leg and back—(3) when the area is varied periodically, after from seven to fourteen reactions with a constant area. The experimenter found considerable variation, curiously enough, in reaction times from day to day and from forenoon to afternoon, so that comparisons between reactions with constant stimulus points and the "transition" reactions, with which the study is mainly concerned, are based on reactions made at one sitting. The rather unusual diurnal variations do not appear to be a matter of practice. However, the experiments are chiefly on one subject and no measure of variability is given. The variability appears to be too great for the results to have much significance. The most important point of the study is the comparison, in the series with periodic variation in the points stimulated, between the reactions with constant stimulus points and the "transition" reactions. The "transition" reactions are longer by from 14σ to 55σ, depending on whether the transition is made from one area to another or from one point to another point within the same area.

Günther (4) reexamines in detail the processes of reaction in recording stellar transits and the differences between reactions to sudden stimuli and reactions to transits. In reactions to transits the conditions in the fore-period between the emergence of the stimulus into the field of vision and the transit give rise to two forms of reaction, the anticipating and the complete. Just as in reactions to rhythmic stimuli the reactions come to coincide in time with the stimulus, so in recording transits the observer tends to anticipate the stimulus. The effect of such anticipation and its relation to methods of registration are now under investigation in the Leipzig laboratory. Günther's problem is the complete reaction and the conditions affecting it. Even in the complete reaction sensory and motor attitudes complicate the problem. The motor reaction tends to become anticipating or at any rate there is no real apperception of the stimulus preceding the reaction. In reactions to transits it is peculiarly difficult to resist the tendency to premature and abbrevi-

viated reactions and they are likely to become ultimately anticipating reactions. Introspective testimony as to the nature of the reaction is unreliable and some objective control is necessary. This was done by conducting practice experiments where the stimulus—artificial star on a kymograph—was arrested just before it reached the meridian. Such series were continued until the proper adjustment of attention was developed and were repeated at intervals to insure the maintenance of the attitude.

Experiments were made with five subjects and with six rates of movement of the stimulus, 3, 1.5, 1, .75, .37, .19 cm. per second. The average reaction times for these rates are 216σ , 204σ , 205σ , 209σ , 225σ , and 249σ respectively. That the attitude in the complete reaction can be developed and maintained is shown by the close agreement in the length of the times by the different subjects and by the uniformity of the distribution about the mode, which is greater than that shown in Alechsiëff's results. It is shown also in the relatively slight influence of variations in rates of transits. Contrary to Alechsiëff, Günther recommends the complete reaction as the best and most reliable method in recording transit observations, on the ground that the adjustment of attention is more readily controlled and that individual differences are less in evidence.

Dunlap (2) finds that a source of error in time measurements with the Hipp chronoscope, due to the effects of use and temperature on the armature spring, may be eliminated by removing the spring and making the necessary readjustments in the counterpoise and circuit arrangements. For the technical details reference must be made to the original article.

Marie and Nachmann (6) describe briefly the arrangement for measuring with the d'Arsonval chronometer reaction times to visual stimuli—seven colored lights—and to olfactory stimuli—odorous liquids. The arrangement for olfactory stimuli is ingenious.

REFERENCES

1. BREITWIESER, J. V. *Attention and Movement in Reaction Time*. (Archives of Psychol., No. 18.) New York: The Science Press, 1911. Pp. 49.
2. DUNLAP, K. The Hipp Chronoscope without Armature Springs. *Brit. J. of Psychol.*, 1912, 5, 1-7.
3. GRASSI, ISABELLA. Einfache Reaktionszeit und Einstellung der Aufmerksamkeit. *Zsch. f. Psychol.*, 1911, 60, 46-72.
4. GÜNTHER, F. Reaktionsversuche bei Durchgangsbeobachtungen. *Psychol. Stud.*, 1911, 7, 229-283.
5. MARIE, A. and NACHMANN, L. Considérations sur les données obtenues avec l'appareil chronometrique enregistreur d'Arsonval au sujet de l'ouïe et du tact. *Arch. int. de neur.*, 9e S., 1911, 2, 364-371.

6. MARIE, A. and NACHMANN, L. De nouveaux dispositifs simples s'adaptant au chronomètre du professeur d'Arsonval pour enregistrer les temps de réaction visuelle et olfactive. *Comptes rendus de la Soc. de Biol.*, 1911, **71**, 661-663.

APPARATUS

BY PROFESSOR C. E. SEASHORE

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Crehore and Meara (1) describe an instrument which records the microscopic movements of a diaphragm by means of light interference. It works on the principle of the tambour, and the record is made by means of interference bands obtained by a mercury vapor lamp. The registration may be made by direct reading or by a photograph. The instrument seems to be capable of exceedingly fine and accurate registration. The article contains a number of illustrations, the records of physiological events showing the registration of sound waves, including those from the human voice.

Dunlap (2) gives a report of a careful experimental investigation of the errors in the fall-hammer, the reliability of the break spark in chronoscopic records, the latency of the magnetic markers, the effect of the reversal of the current in the Hipp chronoscope, and other features. Suggestions are made for improvements in these instruments.

Ponzo (3) describes a new two-point æsthesiometer, which is designed to secure simultaneous and equal pressure of the two points, and furnishes a convenient means of adjusting the distance. It may be obtained from E. Zimmermann, Leipzig, Germany.

REFERENCES

1. CREHORE, A. C. and MEARA, F. S. The Micrograph. *Jour. of Exper. Med.*, **13**, 616-625.
2. DUNLAP, K. The Fall-Hammer, Chronoscope, and Chronograph. *Brit. Jour. of Psychol.*, **4**, 44-55.
3. PONZO, M. Ueber einen neuen Zirkel für die Bestimmung der simultanen Raumschwellen der Körperhaut. *Arch. f. d. ges. Psychol.*, **22**, 390-394.

REPORT OF MEETING

THE CLARK MEETING OF EXPERIMENTAL PSYCHOLOGISTS

The ninth annual meeting of experimental psychologists took place in the Psychological Laboratory of Clark University, Monday-Wednesday, April 15-17. Twenty-four experimental psychologists were present representing the laboratories of Columbia, Cornell, Clark, Dartmouth, Harvard, Hobart, Pennsylvania, Princeton, Wesleyan, and Yale.

The program of Monday afternoon consisted of two papers on Inhibition, the first presented by Dr. H. S. Langfeld (Harvard), and the second by Dr. E. Jacobson. Dr. Langfeld reported upon further investigations into the nature of the negative attitude and the act of suppression. Two methods of experimentation were employed. The one, which consisted in guiding a stylus down the groove of a modified Whipple tracing board, was used to determine what processes are involved in the suppression of movement. Series of trials were made both under positive instruction, *i. e.*, to go down the center, and under negative instruction, *i. e.*, not to touch the sides. As yet there have been too few trials to permit of deductions from the quantitative results, but the introspection in some instances showed imagery corresponding to a negative attitude. It was also found that when the left hand was used, it was more difficult to hold the instruction in mind. The other method was to instruct the subject to recite the alphabet or the numbers from one to thirty omitting certain letters or numbers. In the fore-period visual and auditory imagery predominated. The negative was generally expressed solely in the auditory image of the instruction, but instances of visual imagery of the negative were discovered. In the main-period the words to be suppressed appeared in consciousness at times as auditory-kinæsthetic imagery. In several cases, however, introspection found no trace of these words. Dr. Jacobson reported three series of experiments on Inhibition, which were carried out at Cornell University. In the first the effect of strong sound sensations on simultaneous odors was tested. The results were negative. On the supposition that these negative results might be due to added

effort of attention to the odors in order to overcome the distraction, passive and effortless attention was cultivated. The figures showed some difference from those of the first series, indicating that the abandonment of effort had had some effect, but, in general, inhibitions still failed to appear. Finally, the observers were trained to give strongest attention to the sound, and it was then found that the intensity of the odor sensations was markedly diminished. Many introspective analyses were made of inhibition and attention. The meeting then adjourned to the home of President and Mrs. Sanford who entertained at tea. Later in the afternoon Professor J. P. Porter exhibited a trained dog whose behavior is under investigation.

The evening session was devoted to reports of investigations in progress in various laboratories. The reports from the laboratories of Teachers College and Columbia were given by Professor E. L. Thorndike, of Harvard by Dr. H. S. Langfeld, of Pennsylvania by Professor F. M. Urban, of Princeton by Professor H. C. Warren, of Wesleyan by Professor R. Dodge, and of Yale by Dr. E. P. Frost. Both the reports and the discussions which followed were informal.

The session of Tuesday morning was opened by Mr. C. A. Ruckmich (Cornell), who discussed the History and Status of Psychology in America. Dr. L. R. Geissler (Physical Laboratory, National Electric Lamp Association) read a paper on The Introspective Study of Mental Functions. A systematic functional psychology, he said, has yet to work out its own methods and terminology. Its subject-matter may be divided into (a) *extrinsic relations*, existing between mental and non-mental facts and including the cognitive, adaptive, and organic relations of mind to its corresponding physical, biological, and physiological determinants; (b) *intrinsic relations*, occurring between attributes of the same mental process, or between simultaneous and successive processes, or between individual processes and mind as a whole; and (c) mental *activities*, considered as structural changes in consciousness viewed in the light of the completed mental product or result accomplished. Introspection seems adequate to the problems under (b), but may require supplementary methods such as biological reflection, neurological and pathological observations, systematic study of human and animal behavior, etc., for the problems under (a) and (c). A confusion of the structural and functional aspects of mind may perhaps account for the recent controversies over imageless thought, relational elements, and the distinction between mental act and content. Mr. K. M. Dallenbach (Cornell) followed with a paper on Blindfold Chess Playing. The final paper of

the morning was presented by Professor Dodge, who reported the results of an investigation on mental work. Three students were required to write examination papers of various degrees of difficulty, and a record of the rate of heart-beat was obtained by a device which successfully registered the heart-rate, yet at the same time permitted bodily movements on the part of the observer. Mental work is believed to be physical work, and the rate of heart-beat is taken to be a reliable indicator of the degree of mental work.

The afternoon session was devoted to a general discussion of the experimental investigation of thought: methods, results, applications. The discussion was introduced by Professor Titchener who was followed by President Hall, Dr. Geissler, Professor Dodge, Professor Urban, President Sanford, Professor Warren, Dr. Jacobson, Professor Thorndike and Professor Baird. Professor Titchener then summarized the discussion.

The evening session was held at the home of President G. Stanley Hall. Professor J. P. Porter read a paper reporting an investigation by Professor B. N. Gates (Mass. Agricultural College) on Color Discrimination in Bees. Yellow, white, and crimson paper flowers were used, and it was found that the bees went to the flowers even when they were sealed in glass tubes and when they were reflected in a mirror. Although brightness was not altogether eliminated, the results so far appear to be positive. Further experiments are contemplated. Dr. Geissler gave an informal report of the laboratory maintained by the National Electric Lamp Association, and of the several investigations in the psychology of light and vision which are in progress under his direction. The remainder of the evening was given over to the enjoyment of the hospitality extended by President Hall.

The concluding session of the meeting was held on Wednesday morning, when reports were heard from the Clark, Cornell, and Dartmouth laboratories. Mr. J. M. Fletcher, Mr. E. O. Finkensbinder, and Dr. H. P. Weld reported on investigations which are practically completed, and Professor Baird reported on investigations in progress in the laboratory of Clark University. Professor W. V. Bingham gave an account of the work at Dartmouth and Mr. C. A. Ruchmich and Professor Titchener reported on the investigations in progress in the undergraduate and graduate laboratories, respectively, at Cornell.

It was agreed to hold the tenth annual meeting at Wesleyan University.

H. P. WELD

SPECIAL REVIEWS

PHYSIOLOGICAL AND EXPERIMENTAL TEXTS

Elements of Physiological Psychology. GEORGE TRUMBULL LADD and ROBERT SESSIONS WOODWORTH. New York: Charles Scribner's Sons, 1911. Pp. xix + 704.

Ladd's *Elements of Physiological Psychology* was first published in 1887. For many years it has served as the standard reference work in English on physiological and experimental psychology and its influence on the development of the science in this country has undoubtedly been very great. Many of the younger psychologists got their first introduction to and interest in the experimental study of mental processes through its pages and to them a new edition will be especially welcome.

The extensiveness of the revision which the book has undergone at the hands of the author and Professor Woodworth and which was found necessary in order to make it adequately representative of the present status of the science, is a striking testimony to the vigor with which research has been carried on in psychology and its most closely related sciences during the intervening twenty-four years. To incorporate the wealth of material that has accumulated, every chapter has been rewritten and new chapters have been added. The changes in data, in the arrangement for systematic presentation, and the shiftings of emphasis are so great that one who wishes to compare in detail the treatment in the two editions has difficulty in finding his way about.

The general plan of the new volume is the same as that of the earlier edition. In details of logical arrangement the new edition is superior to the old. Part I. gives a lucid exposition in 292 pages of the development, anatomy, chemistry, and physiology of the nervous system. This part opens with two new chapters on The Place of the Nervous System in the Animal Kingdom and on The Development of the Nervous System in the Individual. These chapters strike the reviewer as the best in the entire book and as most likely to be widely used by students of psychology. The clearness of the presentation of the typical stages in the evolution of the nervous system from the amœba to man, and of the growth of the nervous system in embryonic

life and childhood is an evidence of the skill of the writers in exposition and an impressive indication of the progress of neurological research. The substantial gains to our knowledge in these fields make possible precision of statement and detail in description that are noteworthy. This is especially shown by a comparison of Chapter VI. in the old edition on the development of the nervous system with the corresponding chapter in the new edition. They are so radically different that the latter may fairly be called new.

The succeeding chapters on the gross and minute anatomy of the nervous system incorporate goodly portions from the first edition with the inevitable result that repetition and references back to the earlier chapters occur with great frequency. Thirty-seven figures, for the most part new, richly illustrate and illumine the text. The chemistry of the nervous system is briefly treated in a special chapter, and two chapters are given to nervous conduction and the reflex functions.

The chapter on the end-organs, or receptors, of the nervous system is the only rather disappointing chapter in Part I. It has undergone less change than any other. The psychologist would surely hope to find in a book of this character a full and adequate discussion of the anatomy and physiology of the sense-organs. One is inclined to regret the space given to the gross anatomy, and particularly the 59 pages given to the metaphysics of the relation of mind and body, when one reads the sections on the muscle sense, the effects of light on the retina, the semicircular canals, and the end organs of motion.

The two chapters on the cerebral hemispheres and the localization of cerebral functions have been transferred to Part I., where they logically belong. Many admirably selected illustrations of localization and of the histological structure of the cortex accompany a remarkably clear and critical review of the complex and conflicting literature on cerebral physiology. These two chapters alone make the book a necessary addition to the psychologist's library.

Part II. summarizes in 328 pages the main results of the qualitative and quantitative experimental study of sensation, perception, memory, thought, feeling, movement, and the time-relations of mental phenomena, and the correlations of mental processes with nervous processes. While this part does not purport to review the whole field of experimental psychology, it is nevertheless perhaps the best general treatment we have. In the main the substance and arrangement of the chapters on the quality and quantity of sensations, presentations of sense, and reaction time are unchanged. Practically

every section has been rewritten and such additional data as are at hand have been added. It is a gratifying evidence of scientific productivity in this country to find that these data can be drawn as largely as they are from investigations by American students.

The application of experimental methods to the feelings and to the higher mental processes has necessitated three practically new chapters, the first on feeling, emotion, and expressive movement, including also a brief discussion of fatigue; a second on memory and the process of learning, which reviews not only the results of the experimental study of memory and the acquisition of skill in man but also learning processes in lower animals; and a third on the mechanism of thought, including a brief discussion of attention. The chapter on memory and learning is especially valuable.

The chapters in this part are not of equal completeness and value. While twenty-nine pages are given to reaction time, undoubtedly the best summary of the literature obtainable, seven pages each to fatigue and attention do not, of course, adequately represent the relative amounts of experimental works in these fields. It is perhaps ungracious, however, to mention such a point when one reflects upon the labor already involved in canvassing and critically evaluating a literature which covers practically the whole field of experimentation in psychology, and in preparing a compendium of facts which puts every psychologist under a debt of gratitude to the authors.

Part III., abridged in the new edition to 59 pages, treats of the Nature of Mind and the metaphysical conception of the relation of mind and body to which the results of physiological psychology point. This part could have been omitted without great loss, and the space devoted to a fuller discussion of physiological and experimental problems. The closing chapter of Part I. and sections 14-34 in the last chapter of Part II. set forth clearly the limits of present scientific knowledge concerning psychophysical correlations. They hardly furnish evidence either for or against the "common-sense" dualism, which is maintained, and the discussion of the problem might well have been left to philosophy to which in the Preface it is relegated.

The "controlling purpose" of the book is to present an adequate summary of "what modern science knows, or reasonably conjectures, about the correlations existing between the nervous mechanism and the mental life of man." The erudition of the authors, combined with a keen critical judgment and exceptional skill in presentation, leads to a realization of this purpose in a high degree. The book is

again one that the student of physiological and experimental psychology cannot well be without.

V. A. C. HENMON

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A Text-Book of Experimental Psychology with Laboratory Exercises.
CHARLES S. MYERS. Second Edition. Cambridge: The University Press; New York: Longmans, Green, and Co., 1911.
Part I., Text-Book. Pp. xiv + 344. *Part II., Laboratory Exercises.* Pp. v + 107.

The author tells us in his preface that the work has been thoroughly revised. It is now published in two volumes, the laboratory exercises being bound separately from the text-book. This is in some respects an advantage. It is, however, regrettable that the text-book cannot be obtained separately if so desired.

The recent work of Dr. H. Head, especially the material of the Croonian Lectures¹ has inspired most of the important changes and additions. It is interesting to note the influence of these physiological investigations.

In the paragraph on The Two Systems of Cutaneous Sensibility, which has been partially rewritten, Myers says (p. 13) that there is no evidence, at present, that two separate systems of peripheral nerve fibers correspond to the two systems of cutaneous sensibility. In the first edition, we were told that the work of Head and his collaborators compel us to assume the existence of these two systems. The title of Chapter XVI. has been changed from "On Weight" to "Muscular Effort" and the last part upon effort (pp. 213-217), which is now called an experience and not a "sense," has been partially rewritten and enlarged. The efferent impulses influence our perceptions. For example, they are responsible for the displacements in localization in case of paralysis of the eye muscles. There is no necessity to adopt the hypothesis that the motor impulse is directed toward some cortical sensory center. It is probable that volitional movements effect a disturbance in various systems of unconscious dispositions which Head calls "schemata" upon which is based our awareness of spatial relations. Not only, however, does Myers assume an effect of volition upon unconscious dispositions, but also a consciousness of the effort, which he describes as "the 'act' that is inherent in every conative experience." This latter assump-

¹ These lectures appeared in the 34th volume of *Brain* and not in the 33d volume, as Myers undoubtedly thought they would.

tion is not clearly stated here, but the reference to Ach's experiments on page 332 more fully explains it.

In the paragraph on the Histological Basis of the Spatial Threshold it is stated (p. 223) that the spatial threshold may be impaired in regions where tactual sensibility is normal. This is due to the fact that the impulses concerned with spatial discrimination do not cross until they reach the medulla oblongata, while the impulses concerned with tactual sensibility cross already in the cord. In the paragraph on Relative and Absolute Localization on the Skin, we learn (p. 224) that, due to a similar difference in the place of crossing of the impulses, localization may be present with an absence of kinæsthesia, although normally kinæsthesia aids localization. Before describing Lotze's and Hering's theory of local signs M. says (p. 225): "Introspection and the study of abnormal states show that the ability to distinguish a double from a single touch is something different from the ability to ascribe to the two touches definite and different localizations."

At the beginning of the chapter On Sensibility and Sensory Acuity, we find that lesions of the sensory cortex destroy the power of discrimination and thus affect sensory acuity, and the chapter on Identity and Difference begins with a paragraph on The Influence of the Sensory Cortex.

At the end of Chapter XXIV. (p. 313) there is an interesting description of the effect of thalamic lesion on feeling. The most significant change is a decided increase in the amount of pleasure or displeasure produced by a given sensation.

Among the other changes and additions, we note (p. 33) a description of the vowel quality of pure tones as discovered in the recent investigations of W. Köhler. In the paragraph on Theories of Consonants, reference is made to Liebermann and Révész's article "Ueber Orthosymphonie" (pp. 54 and 55).

In discussing adequate and inadequate stimuli (p. 111), electrical stimuli have been omitted from the list of inadequate stimuli for pain, heat, cold, or pressure.

In the chapter on Size and Direction, it is stated (pp. 282-283) that, although a perception of distance does not consciously affect that of size, yet, primarily, size must depend on distance. An appeal is made to unconscious dispositions as a possible explanation of the relation of apparent distance to the apparent size of objects.

Presumably in consideration of the work in the Cornell laboratory on attention, the doubt expressed as to the possibility of measuring attention, which ended the chapter on that function in the first edition, has now been omitted.

An additional chapter on Thought and Volition has been added. It seems to the reviewer that the book would be better without it, the more in that it does not fit into the general scheme of the book, there being no experiment in the second volume corresponding to this chapter. It is vague in its descriptions and contains statements which are bound to give the student a distorted idea of the present situation in regard to the question of imageless thought. Surely a search through the literature will fail to find "a general agreement that in addition to the objects thought of, in addition to feelings, there is a specific act of thinking, which is totally devoid of sensory content" (p. 327), nor can the view that "there can be no doubt that among the more cultured, especially among those who are practiced in abstract thinking, imageless thought is very common" (p. 327) be entertained by a number of psychologists whom the author would undoubtedly place in this favored class. The description of the genesis of the experience of awareness of meaning is difficult to follow. "Doubtless in the development of species, meaning is prior to thought. In the development of the individual, thought is doubtless prior to language; infants being capable of rudimentary thought before they have acquired internal speech. It is therefore not surprising that imagery, which plays so important a part in the mental life of children and in that of adults who encourage its use, may yet fall away under certain conditions and in certain individuals, leaving recognizable only what can be expressed as 'awareness' of meaning." If meaning is prior to imageless thought, is not this statement against rather than for his theory? We are also told that usually there is no difficulty in separating the content of thought from the act of thinking. The part of the chapter on volition follows closely the experiments of Ach.

In Part II., the experimental portion, the experiment on the after-sensations of tones is omitted. The experiment on The Distinction between Cutaneous and Motor Sensations is also omitted and two experiments upon the labyrinthine sensations substituted. A brief description of experiments on testimony has been added to the experiment on association reactions.

The book is very solidly written and, in most instances, a rare discrimination has been used in the selection of the important facts of psychology. It remains one of the best text-books we have and it is, therefore, more the pity that the author is not as clear in his exposition as he is thorough in his thought. So many facts are contained in so small a space, that the connecting links have had to be

omitted and the reader is compelled to fill in between the lines. This makes it very difficult reading for the beginner and robs the book of much of its usefulness.

HERBERT SIDNEY LANGFELD

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Psychophysik. Darstellung der Methoden der experimentellen Psychologie. W. WIRTH. (R. Tigerstedt's *Handbuch der physiologischen Methodik*. Vol. 3, Abt. 5.) Leipzig, 1912. Pp. 522.

The scope of this book is similar to that of Titchener's *Quantitative Manual* or of G. E. Müller's *Gesichtspunkte*, in so far as it aims at a presentation of the present status of psychophysics. It differs radically from its predecessors in that historical discussions and controversies are almost totally absent. The reason seems to be that psychophysics has found its bearings since the publication of the *Manual* and that most of its problems are beyond the controversial state. Titchener (loc. cit., p. 174) quotes Lipps as expressing the desirability of finding a new foundation for the psychophysical measurement methods, but Wirth has no doubt as to this point and his book shows clearly that psychophysics reaches as far as the field of experimental psychology, a view already expressed by the reviewer on several occasions.

Experimental psychology is a part of general psychology and though finding its immediate material within individual consciousness only, it is to be defined as the study of consciousness in general. In such a study one has to consider all the phenomena of the organism connected with the changes of consciousness. Constant progress in scientific observation can be obtained only by applying the experimental method. A psychological experiment does not make introspection superfluous, but gives it objectivity, because the experiences of different people under the same conditions can thus be observed. Furthermore, introspection may aid in securing the correct performance of the experiments, the subject actively coöperating in assuming and maintaining not only a certain position of the body, but also a certain "inner adjustment" essential for the outcome of the results. On the other hand, the objective data furnish the means of controlling introspection.

The general purpose of psychological experimentation is to find relations between psychical events so as to link them with the general causal connection of phenomena. The ideal of such a mutual dependence is its expression in the form of a mathematical function.

It is not indispensable for this purpose that both cause and effect be measurable, but the expression of such regularities is much simplified if one or both can be expressed quantitatively.

Most experimental investigations deal with sensations, and the problem arises to represent sensation as function of the stimulus. Every functional relation which we have found may be used for the purpose of indirect measurement, which has the formal character of a relation between purely physical quantities but which really is a symptom of a psychological relationship. Such relations are of special interest, because they show the mind in relation to the objects which surround us and thereby show the basis for the purposeful adaptation of our will reactions.

All measurements are affected by errors and the most exact physical determinations are no exception to this rule. Psychology differs in this respect only gradually from the more favored sciences. These errors are due to the fact that every event depends not only on its known causes alone but also on an indefinite number of influences which escape our notice and our control. A repetition of the measurement of a quantity implies the supposition that this uncontrollable complex of causes has remained constant. These variations are very large in the biological sciences which deal with processes subject to many strong influences, and for this reason it is necessary to treat the data of observation according to the rules of the theory of distributions (*Kollektivmasslehre*). The variations of the results in human psychology do not seem to be quite as large as those of animal psychology, because the voluntary control by the introspection of the subject eliminates some sources of variability.

Wirth explains the principles of the theory of distributions and gives the formulæ for the direct treatment of the results, for the application of the formula of Gauss and of the series of Bruns. In his treatment of the theory of psychophysical measurement the method of constant stimuli and its generalizations stand in the foreground of the interest, as is seen from the large amount of space given to the discussion of this method and its problems. We call particular attention to the formulæ for the direct treatment, some of which are of Wirth's own invention and bid fair to be of great practical use.¹

Wirth gives the weights of the observation equations in the method of constant stimuli, calculated by my formula as well as by those of Müller. W. Brown in his book on *Mental Measurement* does the same without giving any reasons, while Wirth's suggestion that

¹ Cf. *Arch. f. d. ges. Psychol.*, 20, 1911, pp. 1-8 of the Literaturbericht.

Müller's solution is especially simple is obviously wrong. It seems curious that both authors should have overlooked the fact that both formulæ cannot be correct.

In a complete presentation of the theory of distributions, Pearson's views ought not to have been omitted. It is true that they have not been applied to psychology until now, but practically the same remark may be made in regard to the series of Bruns. There may be some doubt as to whether this lack of success of Bruns and Pearson is due to the inherent difficulties of their methods, or to certain deficiencies of their presentation. Pearson's papers are not easy reading and Bruns's book is such that it ought to be given to senior wranglers only. The second edition of Czuber's textbook of the calculus of probabilities has made Bruns's views a little more accessible, but psychologists will be grateful to Wirth for his trouble in presenting the theory and practice of the series of Bruns.

It is not possible to give here even a brief survey of the rich experimental material embodied in this book. We merely mention presentations of the methods for studying attention, memory, time perception, feelings, and voluntary reactions. Some of the investigations, as, *e. g.*, those on the influence of sounds of different pitch on attention, or the one on the decimal equation, have not been reported before, and there are only few chapters where Wirth cannot refer to his own investigations. The general purpose of the investigation, however, remains the same everywhere: the goal is to arrive at as exact an understanding of the mental processes as possible; the psychophysical methods are the most indispensable tools for this purpose, but they are not more than tools.

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A NOTE ON APPARATUS

A SIMPLE BLIND FOR THE EYES. An inexpensive type of motoring-goggles (procurable at five-and-ten-cent stores for ten cents) is in use in the laboratory as a blindfold for light and dark adaptation. For the latter purpose, a heavy black paper is inserted in the eye-pieces and kept in place by means of a steel wire spring bent to fit the inside of the eye-piece. This has proved to be a very satisfactory way of excluding light stimuli of even the greatest degree of intensity. For light adaptation, the pieces of black paper are replaced with a set of translucent discs cut from architect's paper. Finally, in experi-

ments upon color-adaptation, the goggles furnish a convenient substitution for the ordinary colored glasses. In this case, gelatin papers of various colors are available for insertion in the eye-pieces. Since the goggles cover virtually the whole field of vision, they afford an excellent opportunity for producing general as well as local adaptation to color.

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BOOKS RECEIVED DURING MAY

- WITHERSPOON, J. *Lectures on Moral Philosophy*. Princeton: Univ. Press, 1912. Pp. xxix + 144. \$1.50.
- STUMPF, C. *Beiträge zur Akustik und Musikwissenschaft*. VI. Leipzig: Barth, 1911. Pp. 165. 5. Mk.
- VOLD, J. M. *Ueber den Traum*. Bd. II. Leipzig: Barth, 1912. Pp. vi + 449-879. 11. Mk.
- HOLLINGWORTH, H. L. *The Influence of Caffein on Mental and Motor Efficiency*. (Columbia Contributions to Psychology.) New York: Science Press, 1912. Pp. v + 166.
- RAND, B. *The Classical Psychologists. Selections Illustrating Psychology from Anaxagoras to Wundt*. Boston, New York, Chicago: Houghton Mifflin Co., 1912. Pp. xxi + 734. \$3.50.
- DOWNEY, JUNE E. *The Imaginal Reaction to Poetry. The Affective and the Æsthetic Judgment*. (Bulletin No. 2 of the Department of Psychology of the University of Wyoming.) Laramie, Wyo., 1912. Pp. 56.
- ELLIOT, H. S. R. *Modern Science and the Illusions of Professor Bergson*. London, New York, etc.: Longmans, Green, and Co., 1912. Pp. xix + 257. \$1.60 net.
- Contributi Psicologici del Laboratorio di Psicologia Sperimentale della R. Università di Roma*. Vol. 1, 1910-1911. Roma: Presso il Laboratorio di Psicologia.
- AUERBACH, F. *Die Grundlagen der Musik*. Leipzig: J. A. Barth, 1911. Pp. vi + 209. Geb. Mk. 5.
- PYLE, W. H. *The Outlines of Educational Psychology*. Baltimore: Warwick and York, 1911. Pp. x + 254. \$1.25.
- RIGNANO, E. *Essais de Synthèse Scientifique*. Paris: Alcan, 1912. Pp. xxxi + 294.

THE
PSYCHOLOGICAL BULLETIN

GENERAL REVIEWS AND SUMMARIES

VISUAL SPACE

BY PROFESSOR G. M. STRATTON

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The tendency, in explaining our perception of depth, to make light of the peculiarly binocular factors continues as in the year preceding. Jaensch, in an elaborate work (7) which merits a fuller account than can here be given, dwells upon a number of facts which tell against the importance of retinal disparity. For him, attention, especially the changes and sweep of attention which go with certain eye-movements, are particularly emphasized, after recounting a range and variety of his own experimental findings. In several regions he discovers apparent shifts of depth with no change of the binocular situation. He brings his theory into connection with visual art by experiments on the perception of intervening illuminated media—colored fluids, and the like—and believes that the peculiar effects which are observable in momentary observation, especially the peculiar character of the attention-process then, help to explain the contributions of impressionistic painters. Not only is the mode of observing which such painters employ peculiarly successful in detecting “atmosphere,” but it also brings in other influences which heighten the æsthetic effect. Finally he divides the truth which nativist and empiricist each claim entire, assigning a part to each.

Other experimenters continue this process of subtracting from the supposed binocular influence. Schubotz (17) repeating Hillebrand’s “Allee” experiment finds, as did Hillebrand, a curvature in the line of objects which apparently form straight rows of receding equal lateral extents; the direction of the curvature, however, sometimes

departs from that found by Hillebrand. He then simplified Hillebrand's procedure, by arranging receding objects into a single row, instead of double rows, apparently straight, and having them not simply to left and to right, but also above and below the line of sight. He finds curvature in all these cases; in the vertical plane, where binocular parallax does not hold, as well as in the horizontal direction where it does. Hillebrand's insistence here upon the importance of binocular parallax is therefore unwarranted. Especially important is the fact that actual curvature occurs in these apparently straight lines with not only binocular, but also with monocular observation, when Hillebrand's factor is absent. Such curvature, he holds, is an original property of visual space. He experimented also upon the "stereoscopic zone"—that is, the range, fore and aft, of a given fixation point, within which there is noticeable plastic effect without double-images; upon the over-estimation of verticals, finding a difference in its amount according as the line is observed with one or with two eyes—a result which does not exactly tally with that since reported by Valentine.¹ This overestimation also he regards as an original property of visual space.

Poppelreuter, in a briefer (14) and a longer (15) report upon the same topic, likewise attacks Hillebrand's conclusions from the "Allee" experiment. He repeats the experiment, with various modifications, finding that the arrangement which produces the effect of equal amounts of increase of depth is actually neither a series of equal binocular disparities nor of equal differences of visual angle, but a series approximately one of arithmetical differences. The "Allee" curve is very irregular, especially as it approaches the observer. The arrangement arrived at monocularly differs but slightly from that reached binocularly—thus agreeing with the findings of Schubotz, as above. Binocular parallax therefore, as against Hillebrand, cannot be the decisive factor in such depth arrangements; it but intensifies and makes more impressive and stable the relief-effect already present in monocular vision. For unless "empirical" factors for the production of relief are present abundantly, monocular depth tends to fade out, especially with inattention, and repetition. Poppelreuter, besides arguing against Hillebrand, opposes Hering's contention that there is a specific depth sensation. Hering's theory of depth, in so far as it attributes importance to a physiological mechanism, he believes to be sound for the apparent *direction* of depth changes, but not for their apparent *amount*. In an appendix

¹ *Brit. J. of Psychol.*, 1912, 5, 8-35.

to his article, Poppelreuter describes several pieces of apparatus for the study of visual space.

Mampell's dissertation (9), which is wholly theoretical and does not appear to have taken any sufficient account of the literature of the subject, surveys various theories of visual space, concluding that extension, depth, and direction are directly given as sensuous properties of the visual impression. The precise localization of the impression as regards distance, whether monocular or binocular, is determined by experience. Monnet (10) presents with true Gallic clearness certain matters of depth-perception that have long been common property.

The depth-effect of ordinary single photographs is considerably heightened, according to Ponzo, by a device which he describes (13). His is a very simply apparatus by which the light from the photograph is twice passed through a convex lens and is reflected in a mirror before coming to the observer's eyes. The disturbance due to the surface of the photograph itself is thus doubly reduced, and a vivid plastic effect is said to result both for binocular and monocular vision. Pigeon (11) describes a stereoscope so constructed that the picture for the one eye can be shifted vertically and for the other eye horizontally,—a device applicable not only to the study of binocular vision, but to the treatment of various abnormalities of the external optic muscles. Special devices add to its value for the medico-legal examination of disturbances of vision, real or simulated. Chaveau (3) likewise deals with stereoscopic vision, seemingly having rediscovered the fact of retinal rivalry. The dominance of the image in the one eye over that in the other is aided by unsymmetrical images, by difference of acuity, and differences of brightness and distinctness in the opposing images.

The changes of apparent depth in the well-known figures of ambiguous perspective is studied by Benussi (2). With catholic temper he accepts the entire list of factors urged in rival theories of these phenomena—the importance of changes of the point of ocular fixation, of the direction of attention, of the readiness of certain ideas to arise, of the different relation of the figure to the surface upon which it might rest. Each and all of these, he believes, play a part. His experimental contribution is chronometric: he timed the appearance of the perspective with different positions of a given figure; and found the proportion of successes and failures in arriving at any perspective when the exposure-time is reduced. He finds that the time between the beginning of the exposure and the rise of perspective-

effect is about three times as great when the position of the drawing is such as to prevent a normal rest and stability of the object. For each position of the drawing there is a preferred perspective. The reduction of the exposure-time reduces the number of cases where perspective appears. Repetition does not regularly reduce the time of appearance of the perspective—a fact which Benussi, I think unwarrantably, believes should make us cautious in explaining here by empirical and associational factors. The stages by which the perspective arises are, according to Benussi, these: the sensory impressions from line and ground are first worked up mentally into a two-dimensional form; and only upon this form as a basis, and not directly upon the impressions themselves, does the plastic effect arise.

Passing now to a group of articles dealing with the perception and the after-effect of motion, Dufour (4, 5, 6) describes an apparatus for the study of the after-effect of visual movement—an apparatus in principle such as has long been familiar in this country. For Plateau's spiral he substitutes a belt-surface with alternate parallel stripes of black and white set at a right-angle to the direction of motion. He finds transfer of after-effect from stimulated and unstimulated eye—a finding which he seems not to be aware had long ago been noted by other observers—even with motions of translation (instead of rotation), for which alone he claims his observations to be novel. Basler (1) measures the interval between the close of the motion which serves as visual stimulus and the beginning of the after-motion in vision, and finds it to be 0.5–0.8 sec. This interval does not seem to be affected either by the speed, the direction, or the intensity of the stimulating movement. Stratton (18) finds that rapid motion in vision, if it is to be perceived as motion, must occupy a time that is approximately the same as that of the least succession which we can notice; and this fact, conjoined with his earlier finding that the least extent within which motion is observable is approximately the same as the just-noticeable difference of visual points in space, takes away all ground for supposing that the visual experience of motion is something unique and elemental and independent of our experience of space and of time.

Regnault (16) notes a number of widespread divergences between the representation of movement visually and the form of the actual movement as revealed by instantaneous photography. From the art of the Bushmen to that of the Greek sculptors there are certain universal exaggerations of the spread of the legs in running, the rise of the body above the ground, as well as in certain "dyschronisms,"

i. e., where—as in the discus thrower, and in the representation of the running of animals and of men—phases of movement actually distinct in time are seen and represented as though simultaneous. Ponzo (12), observing “motion-pictures,” has noted a number of interesting fusions from sources outside of vision—as when he seems to *hear* the visible water-fall or carriage, *smell* the new-mown hay, or *feel the coolness* of the sea. Usually he is able to find something in the actual impressions from these non-visual senses that give a sensory basis for the fusion—impressions that would be quite unnoticed if they did not happen to fit into the total visual object. But such fusions occur for him only when he does not *aim* to observe them; when he is off his guard.

Evidence is tellingly arrayed by McDougall (8), in a mass and detail impossible here to reproduce, that corresponding retinal points are not connected with a common cortical center; at the central parts immediately connected with consciousness the paths taken by the excitation from corresponding points are anatomically distinct. Yet there is an intimate functional relation—now a reciprocal inhibition and now a reciprocal reinforcement of the processes arising from such points. The anatomical separation of the centers, McDougall feels, works against Hering’s theory of color, and in favor of the Young-Helmholtz theory. An interesting though incidental feature of the paper is McDougall’s adoption of the idea that instead of looking for a special cause of *fusion* in things mental, fusion is the fundamental and inevitable process and to be taken for granted wherever there is no special cause working for discrimination. The impressions from points in the two eyes, therefore, must always be seen singly unless there be a special motive for distinguishing them—either a different quality or a different motor tendency in the two impressions.

REFERENCES

1. BASLER, A. Ueber das Sehen von Bewegungen. VI. Mitteilung. Der Beginn des Bewegungsnachbildes. *Pflüger's Arch. f. d. ges. Physiol.*, **139**, 611–622.
2. BENUSSI, V. Ueber die Motive der Scheinkörperlichkeit bei umkehrbaren Zeichnungen. *Arch. f. d. ges. Psychol.*, **20**, 363–396.
3. CHAVEAU, A. Phénomènes d'inhibition visuelle qui peuvent accompagner la reassociation des deux images rétinienne dissociées par les prismes du stéréoscope. Conditions et déterminisme de ses phénomènes. *Comptes Rendus des Séances de l'Académie des Sciences*, **152**, 481–487.
4. DUFOUR, M. Sur la spirale de J. Plateau. *Comptes Rendus des Séances de la Société de Biologie (Paris)*, **70**, 151–2.
5. DUFOUR, M. Un appareil permettant de faire certaines expériences d'optique physiologique. *Ibid.*, **70**, 295–6.

6. DUFOUR, M. Sur quelques phénomènes d'optique physiologique (Deuxième note). *Ibid.*, 70, 485-487.
7. JAENSCH, E. R. Ueber die Wahrnehmung des Raumes. *Zsch. f. Psychol., Ergänzungsband* 6. Pp. 488.
8. McDUGALL, W. On the Relations between Corresponding Points of the Two Retinæ. *Brain*, 33, 371-388.
9. MAMPELL, H. *Zur Theorie des räumlichen Sehens.* (Dissertation.) Strassburg, 1909.
10. MONNET, R. La perception de la troisième dimension. *J. de psychol. norm. et path.*, 8, 104-127.
11. PIGEON, L. Sur un stéréoscope à coulisses. *Comptes Rendus des Séances de l'Académie des Sciences*, 152, 1111-1114.
12. PONZO, M. Quelques observations psychologiques faites durant des représentations cinématographiques. *Arch. Ital. de Biol.*, 56, 81-86.
13. PONZO, M. Un appareil pour la vision plastique du photographies. *Ibid.*, 56, 125-126.
14. POPPELREUTER, W. Beiträge zu einer Theorie der scheinbaren Grösse. *Bericht über den IV. Kongress für experimentelle Psychologie* (in Innsbruck, 1910). Leipzig, 1911, 269-270.
15. POPPELREUTER, W. Beiträge zur Raumpsychologie. *Zsch. f. Psychol.*, 58, 200-262.
16. REGNAULT, F. Le mouvement dans le photographie et dans l'art. *Comptes Rendus des Séances de la Société de Biologie*, 70, 342-343.
17. SCHUBOTZ, F. Beiträge zur Kenntnis des Sehraumes auf Grund der Erfahrung. *Arch. f. d. ges. Psychol.*, 20, 101-149.
18. STRATTON, G. M. The Psychology of Change; How is the Perception of Movement related to that of Succession? *Psychol. Rev.*, 1911, 18, 262-293.

AUDITORY SPACE

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Very little work has been done on auditory space during the past year. M. Truschel (2) briefly reports some experiments to determine the factors concerned in detecting the presence of objects by the blind. The head of a blind subject was shielded in various ways while a piece of cardboard suspended from the end of a stick was moved about and placed in various positions to see how accurately the subject could detect its presence and location. M. Truschel concludes that the chief factor is the localization of the noises reflected from the objects and that odor, air currents, and temperature stimuli are entirely secondary.

M. Pouget's (1) article has only very indirect bearing on auditory space. He describes a test employed in Prof. Siebenmann's clinic

in Basel for measuring auditory acuity. It is the well known method of comparing the length of time that a tuning fork can be heard by a normal ear and by the ear to be tested. This method has been found satisfactory for diagnostic purposes.

REFERENCES

1. POUGET, R. J. Détermination du champs auditif. *Arch. de laryng., ot., rhin.*, 1911, 32, 470-475.
2. TRUSCHEL. Contribution à l'étude du sens de la direction chez les aveugles. *C. r. acad. d. sci.*, 1911, 152, 1022-1024.

TACTUAL AND KINÆSTHETIC SPACE

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Cook and v. Frey (2) studied the influence of the intensity of stimulation on the values of simultaneous spatial thresholds of the skin, using, as the area of stimulation, the volar surface of the left forearm. Two sorts of apparatus were employed, by means of which stimuli of graded intensities and limiting different extents on the skin could simultaneously be applied under admirably uniform conditions. Between any two applications of stimuli there was usually an interval of 30 seconds. It was found that the spatial discrimination of two intenser stimuli was consistently easier than that of two weaker, and this with a range of stimulation from just perceptible to nearly painful intensities. The forearm threshold sank, indeed, to 2 cm. or less with intenser and rose to 6 cm. or more with weaker stimuli. Exceedingly important, however, for exact results, was a preliminary subjective equation of the sensations from the points stimulated, an equation that had occasionally to be repeated during the course of the experiments. Under the most favorable conditions attainable (intense stimuli subjectively equated on pressure points mediating similar sense-qualities), the absolute values of the simultaneous two-point threshold varied, with four subjects, from 1.5 to 3.0 cm. With unequal intensities of the two stimulations the threshold became greater, rising even to 8 cm. This influence of unequal intensities comes out with great clearness if two unequal extents, determined by three limiting points in a straight line, are compared; if points 1 and 2 limit the shorter extent, and points 2 and 3 the longer, an increase of the intensity of point 3 will make extent 2-3, even if objectively twice

as long as 1-2, seem the shorter. It appears, indeed, that two simultaneously given stimuli exert, in a spatial sense, an attraction effect on each other, for a comparison of extents occurs with greater certainty if given successively (1 sec. interval). The attraction is a function of intensity in the sense that the point less intensely stimulated appears displaced towards that more strongly stimulated.

Chinagli (1) discovered that if a circle of wood or other material, 5 mm. thick, and with any diameter smaller than 35 mm., is placed on the skin—preferably of the forehead—it is felt as a filled disc. Similarly with triangles, squares, etc. Furthermore, if a point within the circle was touched, verbal localization placed it outside the circle, but pointing localization within the circle.

Ponzo (3) gives a summary of articles by him already published in the *Memorie dell'Accad. delle Scienze di Torino*, serie 2, t. LX., 1909, and t. LXI., 1910, on the localization of tactual and pain sensations on the skin. Twenty-five different areas of the body were examined, in each of which ten specially sensitive points were marked and tactually stimulated with v. Frey's æsthesiometer. After each stimulation the subject pointed with a rod to the point stimulated, the extent and the direction of error being recorded. The error of direction was determined with reference to a constant axis. For pain Kiesow's æsthesiometer was used. It was found that the errors differed in both size and direction in the various areas, but were fairly constant for a given area. There was no stable relation between threshold-value and accuracy of localization, nor any decrease in accuracy with lower intensities of stimulation. Maximal accuracy appeared on the tip of the tongue, the cushion of the index finger and the middle of the lower lip; minimal accuracy in the costal region. The extent of the tactual errors corresponded well with those given by Weber. The accuracy of localization of painful stimuli proved to be as great as that for tactual. Finally, the results showed that for all the regions investigated most of the errors, as well as the greatest mean errors, were in the longitudinal direction.

Ponzo also reports two new instruments for cutaneous investigation. One (4 and 5) is a simple arrangement for investigating simultaneous spatial thresholds. It secures, particularly, quick variation or equalization of pressures and involves a device for registering any time differences in the applications of the two stimuli. With it the author secured average differences of less than 3 sigma.

The other apparatus (6 and 7) is likewise simple and is designed to secure rapid measurement of the extent and direction of errors in the localization of cutaneous sensations.

REFERENCES

1. CHINAGLIA, L. Riempimento soggettivo di spazi vuoti nel campo delle sensazioni cutanee. *Riv. di Psicol.*, 1912, 8, 133-135.
2. COOK, H. D., & FREY, M. v. Der Einfluss der Reizstärke auf den Wert der simultanen Raumschwelle der Haut. *Zsch. f. Biol.*, 1911, 56, 537-573.
3. PONZO, M. Recherches sur la localisation des sensations tactiles et des sensations douloureuses. *Arch. ital. de biol.*, 1911, 55, 1-14.
4. PONZO, M. Sur un nouveau compas pour mesurer les perceptions d'espace dans le champ des sensations cutanées. *Arch. ital. de biol.*, 1911, 56, 139-144.
5. PONZO, M. Ueber einen neuen Zirkel für die Bestimmung der simultanen Raumschwellen der Körperhaut. *Arch. f. d. ges. Psychol.*, 1911, 22, 390-394.
6. PONZO, M. Sur un appareil pour la détermination facile et précise de la grandeur et la direction des erreurs de localisation dans le champ des sensations cutanées. *Arch. ital. de biol.*, 1911, 56, 148-150.
7. PONZO, M. Ueber einen Apparat zur Bestimmung der beim Lokalisieren von Hautempfindungen begangenen Fehler und deren Richtungen (Dermolokalmeter). *Arch. f. d. ges. Psychol.*, 1911, 22, 105-107.

SPACE ILLUSIONS

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Ponzo in his two papers (5, 6) gives a restatement of some facts and apparatus which he has previously published in other journals, and which were reviewed in last year's report. Schmidt (7) gives a translation and commentary of a lately discovered Latin manuscript of Kant which consists mainly of notes, partly disconnected, used in a disputation. His various arguments, possessing but little psychological interest, are directed against the thesis of his opponent that the sense illusions and the dominance of the perceptual furnish the clue for the interpretation of much in the literature of early peoples.

Benussi's work (1) on solidity reversals of ambiguous figures was instigated by that of Becher and de Boer reported last year. The time of cognition reactions for the perception of solidity was taken for one observer for four positions of a cube. One type of solidity prevailed for each position. The reaction times varied greatly for the four positions. Practice decreased the times but in an irregular manner. Tachistoscopic exposures with many subjects for two intervals demonstrated that the frequency of the solidity perception

was related to the length of the exposure, though generalizations are regarded as unsafe because of the presence of after-images. The most important facts are those derived from introspective observations: Sides differ in apparent size as well as apparent depth, though there is no correlation between the two, as reversals in depth occurred without any change in relative size. The solidity often appears to have a reference to a vertical plane as its base and not to a horizontal plane. Lines non-essential to solidity were often unnoticed. The eye movement and fixation hypotheses are discarded; motives of "*Bodenständigkeit*" are not always available; reproductive processes are not the exclusive factor, as practice does not decrease the reaction times regularly. Certain arrangements of plane lines are associated with a definite type of solidity, and reversals are due to the fluctuating dominance of these plane patterns.

Hofmann (2) in studying the relation between the apparent directions of the horizontal and vertical noted that he invariably gave them both an anti-clockwise twist from their true positions. He normally holds his head inclined to the right and his tests indicate that this head inclination is due to an asymmetrical ocular tension, and that this tension is responsible for the deviation of the apparent direction of the two lines.

The article of Piéron (4) consists mainly of an excellent digest of the literature on the Müller-Lyer illusion. His tests are supplementary to previous experimentation. He maintains that the illusion is based upon a double mechanism, *i. e.*, two theories are applicable. In momentary exposures, estimation is inaccurate and the illusion persists with practice; these facts are explicable in terms of the Einthoven conception. With prolonged exposure, eye movements are regarded as the effective factor.

Tichý (9) worked with the Poggendorff illusion on eight subjects using a variety of methods. His results disagree with Wundt's statement that a reversal of the illusion occurs for the horizontal position when the intervening space is composed of a series of vertical lines. He found that the "continuation line" is invariably located in the direction of the obtuse angle. There is not even a diminution of the illusion for the horizontal position. The illusion does not depend upon binocular vision, freedom or fixity of fixation, knowledge or ignorance. Its size varies directly with the size of the intervening space and inversely with the size of the angle. The facts lead him to reject the Wundtian motives and to accept an explanation in terms of a tendency of the eyes to cross the intervening space by as short a line as possible.

Lewis (3) and Valentine (10) continue the Cambridge work with the tachistoscopic projection method. Valentine attacks the theories of Lipps and Külpe as to the vertical-horizontal illusion. The indefiniteness of the Lippsian concept does not render it subject to conclusive experimental disproof and the author does not regard his tests as final. In opposition to the theory of Külpe that the contour of the visual field produces the illusion by contrast, he finds that the value of the illusion is greater for monocular vision where there is less disparity between the vertical and horizontal diameters of the visual field. Significant facts noted are: Practice increased the illusion with three subjects; the value of the illusion differs for the two eyes; and there is some indication that a maximum value is correlated with a definite length of line. No theory is advanced. Lewis worked with filled and unfilled visual extents and found: The illusion is largest with momentary exposure; its size does not vary directly with the length of the line; there is a maximal effect with a certain degree of filling; prolonged exposure and a minimum of filling produce underestimation; prolonged exposure and unsymmetrical filling diminish the illusion; and practice destroys the effect very quickly. The effective factors are thus duration of exposure, practice, amount and arrangement and nature of the filling. The Wundtian, Hering and all physiological theories are discarded and an appeal is made to the judgmental aspect of perception.

Schubotz (8) seems to be mainly interested in a comparison of monocular and binocular space. He has constructed a very complicated and interesting apparatus which will not allow of a brief description. He deals with four problems. (1) In the vertical-horizontal illusion as exemplified in the square, he finds no correlation between its size and the distance from the observer with varying convergence. With fixation beyond the square, overestimation increases with decrease of depth. Its size varies somewhat directly with the size of the square. There was no maximum value as found by Valentine. He agrees with Valentine that monocular vision gives the largest illusion. (2) By a transparent mirror he superimposed extents monocularly perceived upon those binocularly seen. There was no difference with prolonged exposure. With some conditions of observation, a slight binocular underestimation was correlated with a nearer depth location. (3) He determined the form of apparent straight lines extending in the third dimensional direction. Such apparent straight lines are really straight when located at the height of the eyes. Lines above and below the eyes are curved in the middle

down and up respectively. The construction of two such lines makes the curvature greater and opposite to that which would occur for one line. The results are similar with monocular vision. (4) He attempted to determine the scope or range of binocular unitary vision. The near range is less than the far range. The lateral and the depth ranges are intimately connected. The depth range is greater for points adjacent to the median line; it is increased by a multiplicity of objects in the field, and decreased when the fixation is lateral to the median plane.

REFERENCES

1. BENUSSI, V. Ueber die Motive der Scheinkörperlichkeit bei umkehrbaren Zeichnungen. *Arch. f. d. ges. Psychol.*, 1911, 20, 363-396.
2. HOFMANN, F. B. Der Einfluss schräger Konturen auf die scheinbare Horizontale und Vertikale. *Ber. IV. Kongress f. exper. Psychol.*, 1911, 236-239.
3. LEWIS, E. O. The Illusion of Filled and Unfilled Space. *Brit. J. of Psychol.*, 1912, 5, 36-50.
4. PIÉRON, H. L'illusion de Müller-Lyer et son double mécanisme. *Rev. phil.*, 1911, 71, 245-284.
5. PONZO, M. Sur une nouvelle illusion dépendant du croisement des doigts. *Arch. ital. de biol.*, 1911, 56, 127-128.
6. PONZO, M. Sur quelques illusions dans le champ des sensations tactiles. *Arch. ital. de biol.*, 1911, 55, 20-34.
7. SCHMIDT, B. A. Eine bisher unbekannte lateinische Rede Kants über Sinnes-täuschung und poetische Fiktion. *Kantstud.*, 1911, 16, 5-21.
8. SCHUBOTZ, F. Beiträge zur Kenntnis des Sehraumes auf Grund der Erfahrung. *Arch. f. d. ges. Psychol.*, 1911, 20, 101-149.
9. TICHÝ, G. Ueber eine vermeintliche optische Täuschung. *Zsch. f. Psychol.*, 1912, 60, 267-279.
10. VALENTINE, C. W. Psychological Theories of the Horizontal-Vertical Illusion. *Brit. J. of Psychol.*, 1912, 5, 8-35.

VALUES

BY PROFESSOR WILBUR M. URBAN

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The history of Value-theory for 1911 is to be found more in its enrichment of other fields of inquiry than in any noteworthy additions to the psychological and technical side of the subject. The "trail" leads one to chapters on the Consciousness of Value in books on religion (7), to studies of the psychology of value in books on economics (1) and indeed, as will appear, to strictly philosophical treatises themselves. As a preliminary to this review, however, the pronouncement of that veteran of the subject, Meinong (10), on

fundamental questions, deserves the first place. Prepared by special invitation of the ethical section of the Bologna Congress for 1911, this discussion of the vexed question of psychology and "Psychologismus" in the theory of value justifies in every way his colleagues' expectations of authoritative treatment. His survey of the situation results in the conclusion that "the psychological study of values which has hitherto not been without results, must continue to go its way untroubled." "Zu fehlerhaften Psychologismus würde solche Psychologie aber werden, wenn man sich um ihrretwillen der Anerkennung und Würdigung der Thatsachen unpersönlichen Wertes überheben zu dürfen meinte."

Of the many fruitful contacts of the subject with the social sciences two may be noted here. Durkheim's paper (4) also read before the Bologna Congress, and which, we are told, made a profound impression, explicitly defines sociology as a science of values, attempting to show how it may make values its subject-matter and yet remain a science, how it may conceive them as the products of social life without treating them as merely natural phenomena. As an attempt to deal with very delicate questions, to avoid the difficulties both of naturalism and transcendentalism, and to make values the objects of description without robbing them of their character as values and ideals, the paper deserves close attention.

Anderson's book, favorably received in many quarters, seeks a reconstruction of economic theory in the light of an adequate concept of "social value." Criticizing the "faulty presuppositions" of economic theory, "avowed or implicit," he attempts "to reconstruct them in the light of later epistemological, psychological and sociological doctrine." In this development of "a truly organic doctrine of social value" he makes extended use of the psychological studies of Meinong, Tarde and Urban, and is influenced throughout by the epistemological conceptions of Dewey. He concludes that "value is a quantity, socially valid, not logically dependent upon exchange, but prior to it." "The determinants of value include not only the highly abstract factors that the value theories criticized have undertaken to handle arithmetically, but also all the other volitional factors in the inter-mental life of men in society." Above all, he stresses the "presuppositions" of economic value, ethical and legal.

In his study of James's Religious Philosophy, K. A. Busch says: "One thing he as well as others has brought to light: the final philosophy must be a theory of value." Again in reporting the Bologna Congress for the *Revue Philosophique*, M. Rey tells us that, as the

Heidelberg Congress had been preoccupied with pragmatism, so that of 1911 was concerned primarily with the problem of values, in the domains of science, religion, art, and morals. The former statement may be but an *obiter dictum*, as the latter is, perhaps an exaggeration; yet it is in this spirit that many are working. As indicative of the interest in these problems one may note such papers as those of Maugé (9) and Gillett (5). In Germany, two books by Lüdemann (8) and Pfordten (12) also continue the discussion of the fundamental epistemological and philosophical value-problems. The first, by a professor of theology, is an acute polemic against any deduction of existential from value-judgments, and is valuable for its critical account of the use of value-judgments in both philosophy and theology. The second breathes the spirit of the so-called Freiburg school, but is distinguished in an interesting fashion by a realistic activist note. Conceptual constructions have normative value when they permit of "ein Wirken auf ein Werden."

Whether or not a final philosophy *must* be a theory of value, recent developments seem to indicate that the value-concept is at least a temporary preoccupation. The discussions between Mr. J. E. Russell and Mr. Quick (13, 16, 17) if they have not settled the question of the priority of truth or value, have at least shown that value so dogs the steps of truth as to be inseparable from it. This form of the "ego-centric predicament," if it be such, is likely to continue to give trouble. Significant from this point of view are Bosanquet's Gifford Lectures for 1911 (3). A distinct attempt to rewrite absolute idealism from the point of view of value, it is not surprising that, for its author, "logic is the spirit of value." Notable for the proof it gives of how the permanent insights of this way of thinking may be illuminated and clarified by the value-concept, the unfortunate results of an apparent disdain of the technical discussions of the subject are evident. The most unsatisfactory part of the book is the discussion of the value-concept itself in Chapter VII. As a contribution to this rewriting of idealism, Rubenstein's paper (15) is also worth noting.

It has been charged that "every idealistic theory of the world has as its ultimate premise an unsupported judgment of value." This is no less true of realism. The last chapter of Perry's new book (11), a chapter entitled "A Realistic Theory of Life," is at least an explicit recognition of this, realism's most pressing, problem. If it is the least satisfactory chapter of an interesting book, it is still sufficient to show how far the "new realism" is from any adequate solution of its problem.

Fully one third of Baldwin's new book (2) is taken up with what may be called the "logic of valuation." For him, value represents a distinct and specific mediation of the real, to be put side by side with the mediation of thought and logic. "Both are vital approaches to the real, since each is an essential movement in the commerce of thought with things." It is only, he holds, by a complete understanding of both these types, with their presuppositions and immanent conditions, that we reach a higher immediacy that includes them both—for him the æsthetic. A somewhat similar view, arrived at also by an analysis of valuation, is presented by H. M. Kallen in a recent article (6).

That the present realistic-idealistic *impasse* in philosophy is to be broken through only by becoming more and more conscious of the unsupported value presuppositions of both, is becoming more and more clear. The important paper of Rickert (14) is doubtless no final solution of the problem, but it is at least suggestive in its insistence that the true boundary line (in contrast to the various oppositions in philosophy, of which the idealistic-realistic is perhaps the most pronounced) does not run *within existence*, between the subjective and objective halves of reality, but between the total existence, whether subjective or objective, and that sphere that lies beyond them both, that is the sphere of values."

REFERENCES

1. ANDERSON, B. M., JR. *Social Value. A Study of Economic Theory, Critical and Constructive.* Houghton Mifflin Co., 1911. Pp. xviii+204.
2. BALDWIN, J. M. *Thought and Things. Vol. III.* London: Allen; New York: Macmillan, 1911. Pp. xxi+284.
3. BOSANQUET, B. *The Principle of Individuality and Value.* Macmillan & Co., 1911. Pp. xxxvii+403.
4. DURKHEIM, E. Jugements de valeur et jugements de réalité. *Rev. de Mét. et de Mor.*, 1911, 19, 437-453.
5. GILLET, M. S. Les jugements de valeur et la conception positive de la morale. *Rev. des. Sci. Phil. et Theol.*, 6, 5-31.
6. KALLEN, H. M. Beauty, Cognition and Goodness. *J. of Phil., Psychol., etc.*, 1912, 9, 253-265.
7. KING, IRVING. *The Development of Religion.* New York: Macmillan, 1911. Chapter III.
8. LÜDEMANN, H. *Das Erkennen und die Werturteile.* Leipzig: Heinsius, 1910. Pp. viii+231.
9. MAUGÉ, F. La philosophie scientifique comme système de valeurs. *Rev. phil.*, 1910, 69, 387-408.
10. MEINONG, A. Für die Psychologie und gegen den Psychologismus in der allgemeinen Werttheorie. *Logos*, 3, No. 1.

11. PERRY, R. B. *Present Philosophical Tendencies*. New York: Longmans, 1912. Pp. xv+383.
12. PFORDTEN, O. v. D. *Konformismus. Eine Philosophie der normativen Werte*. I. Tl. Heidelberg: Winter, 1910. Pp. iii+156.
13. QUICK, O. C. The Humanist Theory of Value: A Criticism. *Mind*, 1910, 19, 218-230; 20, 256-257.
14. RICKERT, H. Vom Begriff der Philosophie. *Logos*, 1, No. 1.
15. RUBINSTEIN, M. Das Wertsystem Hegels und die entwertete Persönlichkeit. *Kantstud.*, 1910, 15, 263-269.
16. RUSSELL, J. E. The Humanist Theory of Value. *Mind*, 1910, 19, 547-549.
17. RUSSELL, J. E. Truth as Value and Value as Truth. *Mind*, 1911, 20, 538-539.

PSYCHOLOGY OF TESTIMONY AND REPORT

BY PROFESSOR GUY MONTROSE WHIPPLE

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The most ambitious and important contribution to the psychology of testimony, or—to speak psychologically rather than in the language of jurisprudence—to the psychology of report, is the work of the Commission of the Institute for Applied Psychology for the Investigation of Pedagogical Problems of the Psychology of Report. The members, ten in number, including such well-known writers as Meumann, Stern, Lipmann, and Gross, planned to study the educability of report, to determine whether testimony could be improved by training and to such an extent as to make it worth while, and they determined also to use only events as test-objects, rather than to cling longer to the picture-tests and mere verbal tests of the pioneer experiments. Five studies of educability had already been made and some 15 studies had used events as test-materials, but no previous study had combined these two features.

The Commission decided to employ physical demonstrations as test-material, because these demonstrations can be repeated with exactness, are familiar in nature to school children and command their fullest attention. After elaborate preliminary trials, three apparatuses were selected and with each three demonstrations were made. The apparatuses were (1) a tank of CO₂, stored under pressure in fluid form, (2) an air-pump, and (3) a rotation apparatus. With the last-named, to take but one piece, the three demonstrations were (a) the effect of centrifugal force upon a vessel of water, (b) the flattening of elastic circular rings under rotation, and (c) color-mixture. The details of all nine demonstrations are chronicled minutely and illustrated by numerous photographs.

The observers were 196 girls, aged 12 to 13 years.

In order to bring about a possible effect of training, each observer witnessed all three experiments (9 demonstrations) given at intervals of one week, and after each experiment its three demonstrations were immediately repeated and the observer corrected his written report. The report itself was made by filling out a printed form in which was included (for each experiment of three demonstrations) a series of 12 questions. These questions were so arranged as to be substantially equivalent from the one experiment to the next. They were also classified into seven categories, according as they referred to events, to the statements of the demonstrator, to duration, to sequence, to localization, to color, and to dimensions. For example: "What happened when I opened the stop-cock?" "What did I say when I fastened the rubber tube to the iron tank?" "What color was the rubber tube?" etc. The original report was made in ink. The revisions (following the repetition of the experiment) were made on the same form but in pencil. The article by Baade (1) deals with the results for the questions on the words of the demonstrator only, that of Lipmann (4) with those on color, sequence and localization only. The results for the other categories will appear later.

The net results of the experiment, so far as testimony on verbal features was concerned, was that no demonstrable improvement appeared, either as a result of the repetition of each experiment or as the result of the succession of the three experiments. The earlier experiments did exert a strong influence upon the subsequent experiments, but this influence was sometimes favorable and sometimes unfavorable. Baade has, however, done excellent work in elaborating a system of scoring which promises to afford an exactness in dealing with "logical memory tests" as great as that now enjoyed in dealing with "rote memory" tests.

Lipmann, in scoring the estimates of duration and size, has also devised methods of scoring data which, though too complex to be reproduced here, will be of assistance to those who work in this field. The data show that there is, on the whole, some improvement in these estimates as the result of the successive experiments, but only a very slight improvement as the result of repetition of experiments. In general, durations (8" to 3.5') are strongly overestimated, while extents (19 to 57 cm.) are commonly underestimated. There appeared no positive training-effect in reports on colors, locations and sequences, but the repetitions did bring about a decided improvement in these answers. As a rule, a pupil who displayed much inaccuracy

in his original report also displayed relatively much inaccuracy in his "corrected" report.

So far as reported, therefore, these elaborate and painstaking experiments yield a negative result, and will be chiefly valuable in clearing the way for further studies of the training of observation and memory, in which more potent and vigorous influences are brought into play to effect the improvement.

A second experimental study of the educability of report is presented in the work of Franken (2), who employed what he terms the "*Methode der Entscheidungs- und Bestimmungsfragen*." One hundred questions, drawn from school work, were propounded to 150 pupils, aged 11 to 12.5 years. Each question was given first in a form to be answered by "yes" or "no." ("Do you know what city is the capital of Norway?") After 50 such questions, the series was repeated in a form that demanded a specific answer. ("What city is the capital of Norway?") At this point the pupils of one section checked up their answers; those of the second section were simply told that the next set of questions would be given in both forms. All the pupils then answered a second lot of 50 questions in both forms. Comparison of the answers in the first and second form, in the first and second half of the test, and in the first and second sections then permits conclusions as to the effects of training. Seven coefficients of report are devised and formulas are worked out for each of them. The net result is an improvement in cautiousness in asserting positive knowledge, though answers of "yes" followed by no-answer or by a false answer still persist. The method is of obvious interest and usefulness.¹

Lipmann (5) is convinced that the unreliability of reports of children is due in the main to two things: first, the child does not distribute his attention in the same way as the adult (though his attention is usually well enough concentrated on those details that he does report); secondly, the child is uncritical in filling out gaps in his memory and uses freely material supplied through custom, through his own imagination or through suggestion. It follows that the training of the child in correct report must transform his distribution of attention to one corresponding to that of the adult and must develop a critical attitude toward misstatements in filling out gaps.

Miss Oppenheim (6) has extended the "rumor-test" of Stern, Michel, and Kulischer by using two anecdotes, given in immediate

¹ This article will be reviewed somewhat more fully in an early number of the *Journal of Educational Psychology*.

succession, with the idea of obtaining conditions more akin to those of daily life, particularly of determining whether details of the one story get confused with those of the other. Each story was transmitted through five observers, adult women. The results show strikingly how, even in so few stages as this, rumor becomes extraordinarily unreliable. There is, in general, a progressive abbreviation of the anecdotes; the story becomes less definite and more general in phrasing; each report deviates in two or three points from the preceding; the errors are confusions, substitutions, alterations of temporal and spatial setting; names and dates suffer particularly.

Schramm (8) compared 16 men and 16 women students at Freiburg University by the aid of Stern's test-story. It was read once to them and reported 24 hours later. This is virtually a test of "logical memory." The author concludes that the data point toward a slight superiority of the women, but the reviewer does not find that the differences exceed the probable error of the results.

Virtually identical is the method followed by Vos (12), who read a 40-element story to boys and girls 9 to 14 years old, and obtained reproductions three days later. From his 800 reports he draws these inferences: report is very good at the age of 9, best at 10, then deteriorates decidedly to 13, but improves at 14. Boys surpass girls, both in narrative and deposition, save that boys are less cautious when ignorant (more liable to give false answers than no answers). Boys are at their worst at 13, girls at 9 and 12. Pupils from the better class of homes do better than those from the poorer districts. There are more errors in the deposition than in the narrative, even though no suggestive questions are asked. The test hinges chiefly on auditory-verbal memory.

The work of Heindl, Reichel and Varendonck bears more directly on the application of the psychology of testimony to jurisprudence. Heindl (3) sought to measure quantitatively the amount of error in signalitic reports. He used mass tests and talks almost entirely in terms of averages. His method of computation is open to improvement, as Lipmann points out, and despite the extraordinary mass of data obtained (20,000 reports and 80,000 computations), it is questionable whether he has derived the practical conclusions that he sought. In brief, his method was this: observers stated or estimated the stature, age, color of hair and form of face, either of a stranger who appeared conspicuously before them for four minutes or of a well-known person not present during the reporting. Heindl concludes, among other things, that children are perfectly good observers,

perhaps more objective than adults, but cannot translate their observation into report skillfully. Sample conclusions are: children overestimate the stature of a strange man by 12 cm., of a strange woman by 5.7 cm., of well-known persons by 5.6 cm., etc.

Reichel (7) is a jurist, who writes to impress other jurists with the need of acquaintance with the psychology of testimony. He presents a good account of the present status of forensic psychology, shows in concrete cases how lack of psychological insight may affect the administration of justice, and proposes plans for the study of forensic psychology at universities.

The contribution of Varendonck (11) appeals to jurists, psychologists and educators alike. He was one of several psychologists summoned by the defense at a murder trial in Belgium to give expert testimony concerning the reliability of the testimony of two girls, 8 and 10 years old, whose declarations seemed likely to secure a conviction. Varendonck analyzed the records of the preliminary hearings, reviewed the history of the psychology of testimony, and conducted a half-dozen striking experiments upon school children to demonstrate the unreliability of their reports when implicative and expectative questions are employed. The presentation of his testimony elicited violent outbursts from the court authorities, but it reached the jury and induced a verdict of "not guilty." The psychology of testimony has, therefore, found its way formally into the court room and saved a man's life.¹

The literature upon the psychology of testimony was assembled by Stern (9) in 1909 for the period prior to 1908. The same writer has now published a bibliography (10) of 53 titles covering the period 1908 to 1910.

REFERENCES

1. BAADE, W. Aussage über physikalische Demonstrationen. (Mit besonderer Berücksichtigung der Frage der Erziehbarkeit der Aussage.) 1 Abh. Die Methodik der Versuche u. die Inhalte der Textaussagen. *Zsch. f. angew. Psychol.*, 1911, 4, 189-311.
2. FRANKEN, A. Ueber die Erziehbarkeit der Erinnerungsaussage bei Schulkindern. *Zsch. f. päd. Psychol. u. exp. Pädag.*, 1911, 12, Hft. 12, 635-642.
3. HEINDL, R. Die Zuverlässigkeit von Signalamentaussagen. *H. Gross' Archiv*, 1909, 33, 109-132.
4. LIPMANN, O. Aussage über physikalische Demonstrationen. (Mit besonderer Berücksichtigung der Frage der Erziehbarkeit der Aussage.) 2 Abh. Die Schätzungen u. d. Ergebnisse der Farben-, Lokalisations- u. Sukzessionsfragen. *Zsch. f. angew. Psychol.*, 1911, 4, 312-334.

¹ For details the reader is referred to the *Journal of Criminal Law and Criminology*, in an early issue of which the reviewer will present a more elaborate analysis of the testimony of these children and of Varendonck's experiments.

5. LIPMANN, O. Pedagogical Psychology of Report. *J. of Educ. Psychol.*, 1911, 2, 253-261.
6. OPPENHEIM, ROSA. Zur Psychologie des Gerüchtes. *Zsch. f. angew. Psychol.*, 1911, 5, 344-355.
7. REICHEL, H. *Ueber forensische Psychologie*. München: Bech, 1910. Pp. 64.
8. SCHRAMM, FRITZ. Zur Aussagegetreue der Geschlechter. *Zsch. f. angew. Psychol.*, 1911, 5, 355-357.
9. STERN, C. & W. *Erinnerung u. Lüge in der ersten Kindheit*. Leipzig: Barth, 1909. Pp. 160.
10. STERN, W. Bibliographie zur Psychologie der Aussage, 1908-1910. *Zsch. f. angew. Psychol.*, 1911, 4, 378-381.
11. VARENDONCK, J. Les Témoignages d'Enfants dans un Procès Retentissant. *Arch. de Psychol.*, 1911, 11, 129, 171.
12. VOS, H. B. L. *Beiträge zur Psychologie der Aussage bei Schulkindern. Analyse d. Aussage über eine gehörte Erzählung*. Amsterdam: dissertation, 1909. (Eigenbericht in *Zsch. f. angew. Psychol.*, 1911, 4, 375-378.)

SUGGESTION

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Chojecki (1) carried on a series of experiments on suggestion in the University of Geneva, using as subjects thirty men and thirty women of the university. His tests were three in number: The heat illusion; the Binet test on suggested increase in the length of a series of lines; and increased and decreased tactual sensitivity produced by a magnet. There was found a very low degree of correlation between the suggestibility as discovered by the different tests. In this particular Chojecki verified the results of all investigators of recent years. His results differ from his predecessors in that he found more men suggestible than women. If this result should be verified by later researches we shall be compelled to cast aside the time-honored tradition that women are more suggestible than men.

Of a book of 350 pages Jacoby (2) devotes almost 200 pages to a presentation of suggestion. He discriminates between suggestion and such other related mental phenomena as auto-suggestion and association of ideas. The discussion is unusually sane and scientific for a presentation of this particular subject and is one intended for the general public.

MacDougall (6) applies the term "contrary suggestion" to a group of reactions that could not be wisely designated by any other single term. The following quotations present in brief MacDougall's conception of suggestion, contrary suggestion and the part the two

play in the development of the individual mind. "The first and more elementary form is that of slavish imitation, in which the suggestion is uncritically received and put into execution. It represents the primary and immediate reaction upon a stimulus which at the moment dominates consciousness. In such a case the mind of the imitator is narrow and meager, since the suggestion is either uncomplicated by any system of associated ideas, or by such only as are, in an elementary sense, congruous with it. It is the type of reaction which we call unreflective or precipitate. To have become characteristic of an individual marks him as deficient in all forms of intellectual freedom and independence" (pp. 384-385). "The second form of defect is manifested in an obstinate opposition to what has been suggested. It represents the second stage in development, in which the idea offered to the mind arouses a counter-idea which takes exclusive possession of the consciousness. The outcome, in so far as the psychological nature of the reaction is concerned, is thus equally elementary with that of slavish imitation" (p. 385). "Contrary suggestion represents the method by which the child naturally passes from an uncritical acceptance of suggestions and their immediate embodiment in action, to a reflective consideration of the respective values of two alternative courses when offered for selection, and finally to deliberate action and reasoned reflection in all their forms" (p. 377). The discussion is not confined to the place of counter-suggestion as a phase in the development of the mind of the individual, but a very satisfactory discussion is given of the place of counter suggestion in the social activities of the individual.

In his later treatises (4, 5) Jones merely reaffirms propositions laid down in his larger contribution (3). He defines suggestion so broadly that it includes practically all conscious and "unconscious" cognitive and affective processes (pp. 218, 219). Such a definition finds justification historically in a few eminent English psychologists. Thomas Brown, for instance, used suggestion in this broad way, although he did not include under it unconscious processes. Instead of using the term in this broad way throughout his discussion, Jones actually employs it with a narrow and unusual signification. The usage is so extraordinary that it reminds one of the manner in which Thomas Reid used the term suggestion to signify magic. Jones uses the term to express the transference of an affective attitude (usually sexual) to an object (usually the physician) other than that which originally stimulated that particular attitude (pp. 224, 249). If the term suggestion were properly restricted to this narrow sense and

identified with transference of an emotional attitude (usually unconscious), then Jones would be justified in attacking those who assert that the results secured by psychotherapy are secured by a process of reëducation in which suggestion is the principle or exclusive method. However, to identify suggestion with transference is to go counter to the historical and ordinary usage of the term.

REFERENCES

1. CHOJECKI, A. Contribution a l'étude de la suggestibilité. *Arch. de Psychol.*, 1911, 11, 182-186.
2. JACOBY, G. W. *Suggestion and Psychotherapy*. New York: Charles Scribner's Sons, 1912. Pp. 355.
3. JONES, ERNEST. The Action of Suggestion in Psychotherapy. *J. of Abnorm. Psychol.*, 1911, 5, 217-254.
4. JONES, ERNEST. The Therapeutic Effect of Suggestion. *J. f. Psychol. u. Neur.*, 1911, 17, 427-432.
5. JONES, ERNEST. The Therapeutic Action of Psycho-analysis. *Rev. of Neurol. and Psychiat.*, 1912, 10, 1-12.
6. MACDOUGALL, R. Contrary Suggestion. *J. of Abnorm. Psychol.*, 1912, 6, 368-391.

PSYCHOTHERAPY

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The number of recent articles which may be grouped under this caption is large; the proportion which contain matter of especial psychological interest is small.

Cutten (6) and Bruce have written for the general reader on methods in psychotherapy. The attempt of the former is the more ambitious. He includes in his discussion primitive methods which obtained in different nations; some "healing miracles" of the early Christian church; a defense of the character of Mesmer; an enumeration of cases of healing by relics, visits to shrines, the royal touch, etc. There are interesting passages on Schlatter, the Christian Science movement and the Emmanuel movements, although there is little in the discussion which is new or of unusual importance. The method of treatment is expository throughout. The whole argument is rather disconnected, but the work, in the opinion of the reviewer, is of considerable value as a reference-volume.¹ Bruce's work (4) is a collection of eight popular essays. Its purpose is at least frankly stated: To inform the reader that there are psychotherapeutical

¹ See special review in this journal, 1911, 8, 259.

methods in practical use other and better than those used by Christian Scientists and similar practitioners. Although the author hopes that scientific as well as general readers may find the work valuable, the treatment is really quite superficial. Some very commonplace incidents and doctrines are embellished after the style of a descriptive novel. The opening essay is on the evolution of mental healing, and is an enumeration of theories ancient and modern. In the chapter entitled *Masters of Mind*, the author, himself a layman, unhesitatingly selects four men for eulogy as the "world's greatest psychopathologists." There are chapters on hypnotism and on secondary selves. We are told that suggestion is the chief factor in both scientific and religious "mental healing" but that the true scientist knows that it cannot be used as a cure-all. The author deals tenderly and admiringly with the work of the psychic researchers, differentiating spiritists from adherents to theories of telepathy. He avers that the psychic researchers deserve great credit for inspiration of scientific men: more than one of the four psychopathologists whom he ranks as the world's greatest have become interested in their present work through an early interest in psychic research. The work closes with an essay in appreciation of William James. In the reviewer's opinion the contribution to popular enlightenment made by this book is slight.

The psychoanalytic literature is voluminous. An extensive critique of the method of Freud is made by Kronfeld (13). The first 70 pages are devoted to an exposition of Freud's theory, following which is a detailed criticism of his principal assumptions and hypotheses on factual and logical grounds. Kronfeld asserts that Freud is guilty of *petitio principii* in assuming the truth of his hypotheses. Their validity, says Kronfeld, can be shown only by the correctness of the results obtained by the methods derived from the hypotheses; but there is no criterion of the correctness of the results, save the validity of the hypotheses by which they are to be interpreted. Bleuler (2) attacks the tendency of many of Freud's followers to overgeneralize, and particularly censures the efforts which members of that school frequently make to treat psychopathologically the experiences of poets, artists, etc. He regards Freud's doctrines of "unconscious thought-processes," sublimation, censorship, etc., as "not proven," and as more or less obscure. However, he expresses admiration for his general work, and recommends an open-minded attitude toward the Freudian tenets.

Burrow (5) and Kostyleff (12) have given brief conventional

descriptions of the work of Freud and Jung. Kostyleff has included in his article some comments on current criticism of Freud's doctrines. The danger of indiscriminate application of the psychoanalytic methods and of their use by the novice is pointed out by Freud (9, 7), while Putnam (15) urges the importance of clear metaphysical thinking in dealing with problems with which the method is concerned.

Brill (3) and Jones (11) have followed Freud (8) in the main in an attempt at psychopathological interpretation of experiences of every day life. All these communications follow the same general line of argument, but that of Jones is apparently the most extraordinary. His main thesis is that "certain inadequacies of our mental functioning, and certain apparently purposeless performances, can be shown by means of psychoanalysis to have been *determined* by motives of which we were not at the time aware." (*Italics mine.*) The "determining" factor is always a repressed wish, and some of the consequents determined by it are slips of the tongue or pen, erroneously performed reactions and "automatic" reactions; also, forgetting errands or names and "erroneous perception." Numerous incidents are cited, many being personal. The author's reason for saying that the repressed feelings "determine" these reactions, is that a train of free association, pursued far enough, will reach such an experience, which for the time had been forgotten. To the reviewer such reasoning *post, ergo propter hoc*, seems particularly treacherous. The metaphysical assumptions implied in such a thesis are also hard to reconcile with those which seem necessary to account satisfactorily for other experiences. In the reviewer's judgment, articles of this type emphasize the need of the sharpest distinction between the clinical and the logical aspects of the Freudian doctrines. Whatever clinical value the psychoanalytic methods may have should indeed be demonstrable by the records of the "thousands of cases" to which they have been applied. But that the doctrines are useful as clinical tools does not prove that they are logically consistent. And to the reviewer, at least, it is not yet evident that either therapy or psychology can be permanently benefited by theorizing on the basis of such generalizations as Freud, Jones and Brill use in these articles.

Acher (1) and van Teslar (17) have given abstracts of numerous recent publications on psychoanalysis, most of which are not mentioned in this review.

Frink (10), Rank (16), Nepalleck (14) and Wingfield (18) give accounts of the application of psychoanalysis to problems under their own observation. Their reports, however, are conventional.

REFERENCES

1. ACHER, R. Recent Freudian Literature. *Amer. J. of Psychol.*, 1911, 22, 408-443.
2. BLEULER, E. Die Psychoanalyse Freuds. *Jahrb. f. psychoanal. u. psychopathol. Forsch.*, 1910, 2, 623-730.
3. BRILL, A. A. A Contribution to the Psychopathology of Everyday Life. *Psychotherapy*, 3, 5-20.
4. BRUCE, H. A. *Scientific Mental Healing*. Boston: Little, Brown & Co., 1911. Pp. viii+258.
5. BURROW, T. Some Psychological Phases of Medicine. *J. of Abnorm. Psychol.*, 1911, 6, 205-213.
6. CUTTEN, C. B. *Three Thousand Years of Mental Healing*. New York: Scribners, 1911. Pp. viii+318.
7. FREUD, S. Nachträge zur Traumdeutung. *Zentbl. f. Psychoanal.*, 1911, 1, 187-192.
8. FREUD, S. *Zur Psychopathologie des Alltagslebens*. (3 verm. Aufl.) Berlin: Karger, 1910. Pp. 149.
9. FREUD, S. Ueber "wilde" Psychoanalyse. *Zentbl. f. Psychoanal.*, 1910, 1, 91-95.
10. FRINK, H. W. Psychoanalysis of a Mixed Neurosis. *J. of Abnorm. Psychol.*, 1911, 6, 185-204.
11. JONES, E. The Psychopathology of Everyday Life. *Amer. J. of Psychol.*, 1911, 22, 477-527.
12. KOSTYLEFF, N. Freud et le traitement moral des névroses. *J. de psychol. norm. et pathol.*, 1911, 8, 246-257.
13. KRONFELD, A. Ueber die psychologischen Theorien Freuds und verwandte Anschauung. *Arch. f. d. ges. Psychol.*, 1911, 22, 117-248.
14. NEPALLECK, R. Analyse einer scheinbar sinnlosen infantilen Obsession. *Zentbl. f. Psychoanal.*, 1911, 1, 155-157.
15. PUTNAM, J. J. A Plea for the Study of Philosophic Methods in Preparation for Psychoanalytical Work. *J. of Abnorm. Psychol.*, 1911, 6, 249-264.
16. RANK, O. Ein Traum, der sich selbst deutet. *Jahrb. f. psychol. u. psychopathol. Forsch.*, 1910, 2, 465-540.
17. VAN TESLAR, J. S. Recent Literature of Psychoanalysis. *Amer. J. of Psychol.*, 1912, 23, 115-139.
18. WINGFIELD, H. Four Cases Illustrative of Certain Points in Psychoanalysis. *Brit. Med. J.*, 2, 256-257.

SPECIAL REVIEWS

CHAPTERS FROM MODERN PSYCHOLOGY

Chapters from Modern Psychology. JAMES ROWLAND ANGELL. New York: Longmans, Green, and Co., 1912. Pp. vii + 308.

This book contains eight lectures which Professor Angell delivered at Union College during the early part of the year 1911. As the lectures were prepared for presentation to a general college audience, they remain on the surface of the science. The entire field of psychology is sketched, but only those facts described which are necessary for a general idea of the subject. The style is of that clearness, fluency, and simplicity which we are accustomed to associate with the author, so that the book will not only interest the layman, but will afford the scientist several enjoyable hours.

The first chapter is upon General Psychology. It begins with a discussion of the methods of classification, then touches upon mental elements, instinct and impulses, reason, emotion, and will. It can give, the author says, "but an imperfect impression of the multifarious ways in which the energies of general psychology are engaged." Under the title Physiological Psychology are described the relation of mental to bodily processes, the dependence of mental experience on bodily organization, the relation of feeling to general somatic conditions, and the James-Lange theory of emotions. In Chapter III., on Experimental Psychology, experimentation in general is explained, and some typical experiences in audition, memory, association, and will are described. Abnormal Psychology considers dreams, hypnotism, suggestion, multiple personality, spiritism, telepathy and the subconscious. Chapter V. is divided into Individual and Applied Psychology. The first part includes individual differences in sensation and memory, types of imagery, attention, suggestion, reactions and emotion. In the second part, the usefulness of psychology for education, medicine, law, vocational guidance, and advertising is shown. In the chapter on Social Psychology, the author speaks of the psychology of language, play, and fine arts, the power of imitation and emulation, and the effect of a leader on mobs and crowds. In regard to race psychology, he says that the differences between races do not rest upon innate difference of brain structure but upon differ-

ence of environment and interest. The essay on Animal Psychology begins with the question of animal consciousness and intelligence. Descriptions of some well-known experiments follow. The last chapter, which is on General Genetic Psychology, refutes the theory that the characteristics of the savage are due to lack of reasoning power and efficiency in sensory activity. Their minds are not fundamentally different from those of civilized races nor do there seem to be important differences on the emotional side. "Mental evolution in man consists less in the accidental possession of higher native capacity and more in the better organization and the mastery of the technique of knowledge and thought." The chapter ends with a sketch of mental development in the individual.

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JAMES' PHILOSOPHY

La Philosophie de William James. TH. FLOURNOY. Saint-Blaise, 1911. Pp. 219. Fr. 2.50.

In the spring of 1910 the *Association chrétienne suisse d'Etudiants* invited Professor William James to address them at their reunion to be held in the following October. Professor James, whose health was then seriously impaired, replied accepting the invitation "in principle," saying, that is, that should his health sufficiently improve and should he remain in Europe until October, he would gladly address the Association. The reunion was held, but William James was no more, and to Professor Flournoy fell the solemn honor of addressing the Association in his stead. For many years a warm friend and admirer of the profoundly lamented psychologist and philosopher, Professor Flournoy chose for the subject of his address "The Philosophy of William James." It is this discourse, amplified and doubtless somewhat revised, which now appears in book-form.

Professor Flournoy, and we can say it without exaggeration, has given us a work which is, although in concise form, a sympathetic and penetrating biographical sketch, a notable contribution to letters, and a commanding piece of philosophical reasoning. He sums up with extraordinary articulateness the broader tendencies of the late Professor James's teaching; and all in the spirit of James himself, sometimes almost with his own inflection, challenges, as it were, the coming generations to consider attentively this envisage-

ment of the universe and either to reject it for known and well-weighed reasons, or else to accept it with conviction and enthusiasm.

"By their works ye shall know them;" by their results in experience, alone, can values be weighed; or, in language more current, the sole test of truth—whatsoever its definition may be—or of any other value is found in empirical verification. Not a subversive doctrine, this: yet it is the touchstone to James's Pragmatism. This principle, which all natural science boasts of as its cardinal doctrine, from which indeed it takes the name empirical science, is nevertheless scouted as an absurdity when proposed as a general philosophic rule. "Morality estimated by its cash-value!" "The existence of God proved by the results experienced from believing in God's existence!" Yet the truth of not a single one of the laws and theorems of science is tested in any other way. The reason for this singular paradox is, if one compares the deeper-lying intention of James with that of his opponents, not hard to find. The effort of the day is mainly spent in the material sphere. Here we have so genuinely desired to achieve results that we have come down to the frankly humble attitude of empiricism. Here we admit that we get our truth *a posteriori*. In other spheres where the demand for actual—and certainly actual—results is by no means so stern, another tradition prevails; and one that is more gratifying to the familiar form of self-esteem. These truths we have *a priori*; or at least we can secure them in our hands without verification and safe from refutation, and so henceforth dispense them at our pleasure. And few persons genuinely care enough about these truths to examine this pretension. The maker of a printing-press is sharply held up if his factory has been playing with untruth: but the clergyman's account of God is scrutinized, if at all, with an eminent lassitude. Were the splendid pretension examined, James said, it would be found to be a fiction. For reality is the infinitely infinite flux of things and events, and its bigger truths can no more be embraced in a few off-hand formulæ, thought out in the rationalist's arm-chair, than can its truths about material things. In both cases alike we must test our "truths" by verifying them in subsequent experience. And one need be no pragmatist (need not, for instance, believe that Pragmatism includes a *definition* of truth) in order to see that that means of winning truth which has brought material science to the position which it now occupies must be applied in all other fields of activity if a similar success is to be achieved. James saw this. And a

thorough-going empiricism is one of his fundamental articles—Radical Empiricism.

Now this requires a rather curt dismissal of many cherished fancies: it involves, specially, the relinquishing of nearly all the products of the rationalistic movement of thought. For rationalism, as the term is used by James, covers any theory or system which is so remote from the concrete and infinite reality as to be insusceptible of empirical verification. If it can make no difference in subsequent experience whether a certain system is true or false, then (although it may be "internally consistent") the terms truth and falsity in no way so much as apply to it. Guided by this maxim James is a pluralist and not a monist. Furthermore, one needs but to loosen one's allegiance to certain ingrained prejudices of the day and generation in order to discover in that pure experience which empiricism makes its court of last resort, the immediate evidence of many facts to which one had previously been blind. And notable among these are the efficacy and freedom of the human will, the actual thereness of ungainsayable evil, and—for certain favored persons (unless your prejudices fortify you arbitrarily to throw out of consideration their life protocols)—the presence and coöperation of God. James believed, then, that what men do makes a difference in the universe, and that they might (if the word has any meaning at all) have done otherwise; that evil is there and is evil; and that God is, and is amenable to contact with human beings. These and other propositions, conceived as heretical in certain quarters yet derived by means of the same open-eyed empiricism, involve clearly an entire philosophy. Of all this Professor Flourney takes a careful survey.

To many readers of this volume it will doubtless seem that the philosophical attitude of the late Professor James lacks a certain high impersonality and detachment, lacks the sort of thing that one finds in a treatise on elliptical functions and in the pages of approved dialecticians. This may be so; and the presence of a certain human warmth, above all James's acknowledgment that human volition plays a part in philosophizing, is highly repugnant to some philosophic traditions. Yet it is to be remembered that in the case of elliptical functions human will and human weal are no part of the subject under discussion; whereas in the case of the whole universe, which is the subject-matter of philosophy, man and all his concerns are integrally involved. They dare not be neglected. And if James writes as a man who as a man faces the problem of the

universe, as one who, shoulder to shoulder with others in his likeness, scans the quiet visage of the Sphinx, so too, after all, when one comes to think of it, the most impersonal chapter ever written upon the Absolute implies also a writer, but one who thinks to be in cloaked yet closest intimacy with this same Sphinx. This difference of attitude is worthy of note.

Professor Flournoy has admirably succeeded in revealing the deep springs of a sea whose surface, broad and flowing and reflecting light from a thousand facets, might well have beguiled the most resolute explorer. But he has done more, for he has somehow given us a glimpse once again of the immediate person, the charm, the motion, and the moral vigor of the late Professor James. It is a volume which lays the friends and pupils of William James under a deep debt of gratitude, and one which will give to coming generations some hint of what that privilege was which is not to be theirs.

EDWIN B. HOLT

HARVARD UNIVERSITY

BOOKS RECEIVED DURING JUNE

BOWNE, B. P. *Kant and Spencer. A Critical Exposition.* Boston and New York: Houghton Mifflin Co., 1912. Pp. xii + 440. \$3.00 net.

GALLINGER, A. *Das Problem der objectiven Möglichkeit. Eine Bedeutungsanalyse.* Leipzig: Barth, 1912. Pp. vii + 126. M. 4.

HENNIG, R. *Die Entwicklung des Naturgefühls.—Das Wesen der Inspiration.* Leipzig: Barth, 1912. Pp. 160. M. 5.

Vorschläge zur psychologischen Untersuchung primitiver Menschen. (Beih. z. Zsch. f. angew. Psychol. u. psychol. Sammelforsch.) Leipzig: Barth, 1912. Pp. 124.

HOCKING, W. E. *The Meaning of God in Human Experience. A Philosophic Study of Religion.* New Haven: Yale University Press; London: Frowde, 1912. Pp. xxxiv + 586. \$3.00.

PARTRIDGE, G. E. *Genetic Philosophy of Education.* New York: Sturgis and Walton, 1912. Pp. xv + 401. \$1.50 net.

JAMES, W. *Essays in Radical Empiricism.* New York: Longmans, Green, and Co., 1912. Pp. xiii + 283. \$1.25 net.

NOTES AND NEWS

THE June number of the BULLETIN, entitled the Experimental Number, was prepared under the editorial care of Professor W. B. Pillsbury.

DR. DANIEL STARCH has been advanced to the rank of assistant professor at the University of Wisconsin.

J. CARLETON BELL, Ph.D. (Harvard), managing editor of the *Journal of Educational Psychology*, and director of the psychological laboratory in the Brooklyn Training School for Teachers, has been appointed professor of the art of teaching in the University of Texas. Dr. Bell will devote his attention chiefly to the experimental investigation of problems of teaching.

PROFESSOR WILBUR M. URBAN, of Trinity College, has been granted leave of absence for a year. The larger part of the time will be spent in study and investigation with Professor A. Meinong in Graz.

AT the eighty-first annual commencement of Wesleyan University at Middletown, Conn., held on June 19, the degree of doctor of laws was conferred upon Dr. Amos J. Givens, proprietor of Givens Sanitarium for nervous diseases at Stamford, Conn.

THE following items are taken from the press:

STEPHEN S. COLVIN, professor of psychology in the University of Illinois, has accepted a chair in educational psychology in Brown University.

HARRY MILES JOHNSON, Ph.D. (Hopkins '12), has been appointed psychological assistant in the physical laboratory of the National Electric Lamp Association, Cleveland, Ohio.

M. E. HAGGERTY, of Indiana University, has been promoted from an assistant professorship to an associate professorship of psychology.

THE University of California has conferred the doctorate of laws on Dr. E. C. Sanford, professor of psychology and president of Clark College.

PROFESSOR G. M. WHIPPLE, of Cornell University, has been granted a half year's leave of absence. He will make a study of the recent developments in applied and educational psychology in various educational centers of Europe.

THE PSYCHOLOGICAL BULLETIN

GENERAL REVIEWS AND SUMMARIES

RECENT LITERATURE ON THE BEHAVIOR OF THE LOWER INVERTEBRATES

BY PROFESSOR A. S. PEARSE

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Protozoa.—Von Prowazek's book (27) on the general physiology of the Protozoa contains a full discussion of their reactions to various stimuli.

Mast (20) gives an extremely interesting account of the habits and reactions of *Lacrymaria*, an infusorian sometimes found among organic debris. The body and head of this protozoön are connected by a slender neck, which is capable of extraordinary extension—to eight times the length of the body or fifty times its own length when contracted. Mast gives evidence to show that the extension of the head is due to the pulling action of the oral cilia, rather than the activity of the neck itself; the withdrawal after extension, however, he attributes to the elasticity of the neck.

"The direction in which the neck turns is in all probability regulated by internal factors," and "the direction of locomotion of *Lacrymaria* in swimming is regulated almost entirely by the movements of the head. . . . The body follows the head in a tortuous course. *Lacrymaria* moves backward, when free, if stimulated at the anterior end. Practically all the remaining reactions are in the nature of random or trial movements, movements which are determined largely by internal factors, the nature of which is as yet unknown." It is interesting to note that, although the direction of reaction is structurally determined in some protozoans (*Paramecium*, *Oxytricha*) and has a definite relation to a particular side of

the body in others which are apparently radially symmetrical (*Didinium*), *Lacrymaria* turns its head toward any side. "The same cilia are consequently not always involved in the forward stroke in the process of turning, as is true for *Didinium* and *Cedogonium*. During conjunction the reactions of the two individuals are not coordinated. Each responds to stimuli independently." Mast (21) has also made a careful study of the reactions of the flagellate *Peranema*.

Although Metalnikow's study (23) of the digestion of infusorians is primarily physiological, it contains many points of interest to students of animal behavior. More food vacuoles are formed in an acid medium than in an alkaline one; alcohol and small doses of arsenic stimulate their formation; they appear more slowly at low temperatures, and cease to be formed at 33-34°. The addition of trypsin to the water containing a *Paramecium* accelerates its digestive processes. *Paramecium* shows selection in taking its food and digestible particles circulate longer inside the body than others.

Ulehla (30) has made a very careful study, by means of a paraboloid condenser for dark field illumination, of the movements of the flagella of various flagellates, algal swarm-spores, bacteria, and antherozooids. He gives a comprehensive review of the literature and concludes: (1) Moving flagella describe variable figures, which are, however, definite for each kind and which seldom take the form of simple rotation; (2) flagella have a complicated internal structure; (3) the rate of movement of flagella is much more rapid than has been supposed; (4) the regular beat is easily disturbed and may be modified; (5) flagella exert their propelling influence like oars, not like screws; (6) the movements of flagella may be grouped under six classes.

McClendon (19) points out that the movements of *Amoeba*, when subjected to an electric current or to certain chemical substances, are like the movements of other colloids under similar circumstances. He believes that the behavior of electrolytes in passing the plasma membrane influences the direction of locomotion.

Harper (12, 13) has investigated the geotropic reactions of *Paramecia* that have ingested particles of iron. He believes that geotropism is due to "a passive orientation not involving the irritability." The *Paramecia* show an increased upward orienting tendency which persists as long as the particles of iron remain in the posterior end. A magnet placed at one side of a jar containing iron-laden animals causes them to stream upward in the stronger part of the field, and there is a return toward the bottom in the weaker part.

"The magnet is effective in producing this circulation by diminishing the effect of gravity on animals containing iron. It also exerts a passive pull upon them, and they gradually swing into their finally oriented position in a vertical path under the combined influence of the magnet and gravity. The oriented path is consequently a curve."

Wager (31) has made a very comprehensive study of the aggregation forms assumed by *Euglena* and other microscopic organisms and has reviewed the literature on this subject. He experimented with *Euglena*, *Chlamydomonas*, *Glenodinium*, *Volvox*, *Spirillum*, and with masses of finely divided particles in liquids. *Euglena* usually moves toward the light, and phototropism may interfere with the characteristic aggregations. In the dark or in red light, however, if *Euglenæ* are crowded close enough together to oblige them to move slowly, gravity causes them to sink downward with the posterior end foremost. Such a downward movement of a mass of *Euglenæ* brings about a counter current and some individuals may move upward, or they may be brought into a region where they are not crowded, and having been oriented with the posterior end down by gravity, they swim upward. Masses of *Euglenæ* show a tendency to cling together like all small bodies suspended in liquids. Wager concludes: "The action of the physical forces, gravity and molecular attraction, over which *Euglenæ* have little or no control, appears, therefore, to play an important part in their life history, and, whilst not inhibiting their power to move, compels them to limit the sphere of their activity to certain definite areas in such a way as to promote a more or less regular dissemination of them through the liquid, and this prevents any undesirable congestion of the organisms in one place." He believes that many of the so-called cases of geotaxis and some phenomena of plankton distribution may be found to be explainable as purely mechanical phenomena.

Desroche (6) has studied the phototropism of *Chlamydomonas* zoöspores in capillary tubes. These organisms are positively phototropic at times. Changes in light intensity do not affect the rate of their locomotion.

Cœlenterata.—Bohn (1) maintains that *Actinia* shows a diurnal rhythm, expanding at night and contracting during the day, that is due to light. Nevertheless, though such rhythmical movements are kept up for some time if animals are kept continuously in the dark, individuals kept uninterruptedly in the light will finally expand.

Carpenter (2) contributes some interesting facts in regard to the

habits of the rose coral. This animal is nocturnal and remains contracted during the day or when it is strongly illuminated at night. Its feeding habits differ from those of other corals, and are adapted for capturing plankton. Nervoid impulses resulting from chemical or tactile stimuli applied to a particular polyp may be transmitted to other individuals of a colony. Carpenter believes that branched cells occurring in the mesoglea may serve as adjustors by transmitting impulses from the ectodermal receptors inward.

Parker (24) has studied the reactions of *Metridium*. He shows that the mesenteric muscles and the annular oral muscle may be caused to contract by stimulating the outside of the body column. When an anemone is cut nearly in two, nervous transmission may take place through any connecting portion of the body except the lips. These facts are considered in connection with histological evidence and Parker concludes that the nervous system lies mostly in the supporting lamella; not, as the Hertwigs believed, in the fibrillar layer at the base of the ectoderm. Parker anæsthetized *Metridium* with magnesium sulphate and then obtained what he believed to be non-nervous responses from the muscles.

Schmid (29) has observed that *Cereactis aurantiaca* assumes an erect position with the tentacles in the form of a rosette when illuminated, and from experiments in which he used solutions of calcium chromate, calcium bichromate, methyl green, and copper sulphate as color filters, he asserts that the same may be said for red, yellow, green, and blue light. In the dark, however, this actinian assumes a "sleeping position" with the tentacles drooping and the body relaxed.

Annelida.—As a result of tests with nitric, hydrochloric, sulphuric, and acetic acids, Hurwitz (17) asserts that the responses of earthworms to solutions of acids may be ascribed to the effect of the hydrogen ions in such solutions. Judged by its responses, the earthworm's discrimination of weak acids is better than that manifested in man's sense of taste. The earthworm agrees with man in being more sensitive to acetic acid than would be expected from the degree of dissociation in solutions of that acid.

Parker and Parshley (25), studying the earthworm, show that though a moist surface is favorable for locomotion, a dry one acts as a stimulus to bring about avoiding reactions. They also demonstrate that the receptors for stimulation by dryness are situated at the anterior end of the body. The avoiding reaction disappears when the prostomial region is removed or anæsthetized.

Hargitt (11) extends his previous experiments on the behavior of tubicolous annelids to new species. He pays particular attention to what may be called "anti-tropic" light reactions, but also discusses other points. His paper concludes with a general discussion of the laws of behavior with particular reference to the variability of reactions.

Echinodermata.—Holmes (16) has studied the light reactions of the sea-urchin *Arbacia punctulata* in some detail. This animal usually reacts negatively to light and responds to local stimulation by erecting its spines, but it may become positively phototropic in weak light and will move toward the light to get into a shaded region. Cutting the oral nerve-ring does not interfere with local reactions, which are, in fact, usually characteristic in isolated portions of the body, but such an operation destroys the usual negative photic reaction.

Cowles (4) has studied the responses of the sea-urchin and starfish to changes of light intensity. There is a general ectodermal sensitiveness to light in both these echinoderms. The pedicellariæ of *Toxopneustes* react to an increase or decrease in light, even after they have been removed from the body. Cowles discusses von Uexküll's work at some length.

Mollusca.—Yung (32) shows that, though *Helix* frequents shady crevices during the day and is active at night, it does not react to light, but rather to heat. The eyes possess little acuity and the characteristic reactions to and from shady places take place after they have been removed.

Lefevre and Curtis (18), in their study of the breeding habits of fresh-water mussels, make some interesting observations on the behavior of the bivalved glochidium larva. The glochidia studied were of two kinds: the hooked, parasitic on the external parts of fish, and the hookless, which attach themselves to the gills of fish. When they pass from the parental marsupium they do not swim but fall to the bottom and remain there until they become attached to a fish or die. When free the two kinds of glochidia exhibit marked differences in behavior. The hooked form frequently makes spontaneous snapping movements with the valves, and may be induced to react more readily by mechanical than by chemical stimulation. The hookless form usually does not respond to tactile stimulation alone, but responds quickly to blood and other chemical substances. Both forms may be anesthetized by weak solutions of magnesium salts, but chlorides of Na, K, and NH_4 produce the snapping reaction.

Hooked glochidia readily grasp a needle or a piece of paper and "do not relax but remain attached to the object until they die."

Haseman (14) reports some very interesting observations and experiments with three snails of the genus *Littorina*, which are found in definite zones along the shore at Woods Hole, Mass. Individuals of *L. litorea* located on vertical surfaces between tide marks exhibit oscillatory movements which correspond to those of the tides, but they do not exhibit such movements when on horizontal flat surfaces between tide marks or when below low-tide marks. "The primary directive force for rhythmical movements is the surface film of water. The secondary directive forces are the quiescent position of desiccated individuals, character of surfaces, moisture and food." Light apparently does not influence such movements and this species shows no rhythm in the absence of tidal changes, as Bohn has asserted.

The behavior of several snails of the genus *Physa* is the topic discussed by Miss Dawson (5) in a very interesting paper. The relation of these animals to "natural environment" is treated at some length. The most important factors limiting the snails to particular habitats are shallow water, minimum amount of shade, few enemies, minimum amount of debris, protection from waves and currents, moderate amount of water weeds, and well aerated water. The secretion of mucus is an important factor in locomotion. Mucus forms an epiphragm to seal the snail in its shell during hibernation, and the spinning of mucus threads plays a prominent rôle in the daily life of *Physa*. These threads are formed as a snail floats upward through the water. They are not only used as highways in going to and from the surface, but also help to collect food, as their viscosity causes many food particles to become attached to them and these are devoured with the threads. The mucus surrounding the egg masses is never eaten; apparently it is too tough. *Physa* is omnivorous, though the usual diet is largely vegetable. It passes through a hibernating stage during which no food is taken and the body decreases in size. This snail is not very sensitive to the presence of food substances in the water; it will turn toward food one centimeter away. In a starved individual feeding reactions are called forth by mechanical stimulation, but a well-fed snail must be affected by both mechanical and chemical stimuli in order to feed. Respiration and sensitiveness to air are considered in some detail. *Physa* shows a positive reaction to oxygen and is negative to carbon dioxide. An animal without air in its "lung" is negatively geotropic. The last section of this paper takes up "some psychic phenomena of

Physa." This snail is very sensitive to contact stimuli and is strongly thigmotropic. "A new experience produces a shock to Physa which seems to deprive it temporarily of its sense of gravity." "By the use of the siphon [as a tactile organ] Physa shows that it distinguishes changes in its environment. By a process of association it 'remembers' the location of the surface film, the character of the sides of the aquarium, and even the relative depth of the water. It also shows the development of neutral habit." The reactions of young snails differ from those of adults; they show no "fear reactions," and this may be due to the lack of development of the nervous system. Some activities, like the tapping reaction of the siphon, change their character as the snails grow older.

Piéron (26) succeeded after twenty-four hours in teaching the cephalopod *Octopus vulgaris* to reach through a side opening in a test-tube, instead of trying to get through the glass, in order to seize a crab inside the tube.

Crustacea.—In a paper too comprehensive for review here, Doflein (7) has made a very interesting study of the habits and reactions of certain prawns. He considers color changes, locomotion, feeding, the effect of operations on the nervous system, photoreception, tangoreception, and general habits. The paper is well illustrated.

In another paper Doflein (8) calls attention to the fact that the first antennæ (antennules) of certain land crabs have organs of smell that differ somewhat in structure from taste organs found in the same situation on aquatic decapod crustaceans. He believes that such structures changed from tasting to smelling organs as the crabs migrated from the water and took up a terrestrial mode of existence. They are concerned with chemoreception in water or on land, and their adaptability furnishes further evidence that there is but little or no difference between the gustatory and olfactory sensations of many invertebrates.

Chidester (3) describes the mating habits of four crabs and gives an extended discussion of sex discrimination in arthropods. In the four species studied, sex discrimination is through tactual stimulation. The female is passive when grasped by a male. Males attempted to mate with other males and with fertilized females of their own species, but did not attempt to mate with individuals of other species. Chidester discusses general topics related to his paper. In the Crustacea as a whole, sex discrimination is kinæsthetic and tactual. "In the Insecta, sex discrimination is by smell; Forel's 'contact-odor sense.' . . . Sexual selection on the part of the female has not

been definitely established in the Arthropoda. We must consider that the successful male is the one who first demonstrates his maleness to the female. Though strength is a great factor, opportuneness of proximity appears to be a greater one." The conclusions of Darwin, Alcock, and others that the mating dances of certain male crabs (*Uca*) are for the purpose of sexual selection, are thus discountenanced by Chidester without review but perhaps justly.

Matula (22) studied the influence of certain ganglia of the central nervous system on the rhythmical respiratory movements of *Squilla mantis*. Extirpation of the cerebral ganglion or of the sub-esophageal ganglion caused little change in the rhythm, but the removal of the first thoracic ganglion caused respiration to cease.

Drzewina and Bohn (10) have investigated the reactions of several marine invertebrates in sea water containing a little potassium cyanide. "Sensibility" to light disappears before tactile sensitiveness. The light reactions of some crustaceans were changed from positive to negative.

Schmid (28) observed that, though *Zœa* larvæ were in general negatively phototropic and sank through the water when in the light, they also showed marked sensitiveness to differences in temperature and often made quick backward movements when they came to a place (Temperaturgrenze) where the temperature of the water changed rapidly.

Holmes (15) reviews thirty-six papers on the behavior of lower invertebrates, some of which were noticed in this journal a year ago.

REFERENCES

1. BOHN, G. Comparaison entre les réactions des actinies de la Méditerranée et celles de la Manche. *C. r. Soc. Biol.*, Paris, 1910, 68, 253-255. Les réactions des actinies aux basses températures. *Ibid.*, 1910, 68, 964-966. Intervention de la vitesse des réactions chimiques dans la désensibilisation par la lumière. *Ibid.*, 1910, 68, 1114-1117.
2. CARPENTER, F. W. Feeding Reactions of the Rose Coral (*Isophylla*). *Proc. Am. Acad. Arts and Sci.*, 1912, 46, 149-162.
3. CHIDESTER, F. E. The Mating Habits of Four Species of the Brachyura. *Biol. Bull.*, 1911, 21, 235-248.
4. COWLES, R. P. Reactions of the Sea Urchin and Starfish to Changes of Light Intensity. *Johns Hopkins Univ. Circ.*, 1911, 1-7.
5. DAWSON, J. The Biology of Physa. Behavior Monographs, 1911, No. 4. Pp. 120, 6 pls.
6. DESROCHE, —. Sur le phototropisme des zoospores de *Chlamydomonas Steinii* Goros. *C. r. Acad. Sci.*, Paris, 1911, 152, 890-893.
7. DÖFLEIN, F. Lebensgewohnheiten und Anpassungen bei dekapoden Krebsen. *Festschr. R. Hertwig*, 1910, 3. Pp. 76. 4 plates.

8. DOFLEIN, F. Über den Geruchsinne bei Wassertieren. *Biol. Centralbl.*, 1911, 31, 706-707.
9. DRZEWINA, A. Sur la résistance des crustacés au cyanure et les effets sensibilisateurs de cette substance. *C. r. Soc. Biol.*, Paris, 1911, 71, 535-537.
10. DRZEWINA, A., et BOHN, G. Modifications des réactions des animaux sous l'influence du cyanure de potassium. *Ibid.*, 1911, 70, 843-845.
11. HARGITT, C. W. Observations on the Behavior of Tubicolous Annelids. III. *Biol. Bull.*, 1912, 22, 67-94.
12. HARPER, E. H. The Geotropism of Paramœcium. *J. of Morph.*, 1911, 22, 993-999.
13. HARPER, E. H. Magnetic Control of Geotropism in Paramœcium. *J. of Animal Behav.*, 1912, 2, 181-189.
14. HASEMAN, J. D. The Rhythmical Movements of *Litorina litorea* Synchronous with Ocean Tides. *Biol. Bull.*, 1911, 21, 113-121.
15. HOLMES, S. J. Literature for 1910 on the Behavior of Lower Invertebrates. *J. of Animal Behav.*, 1911, 1, 393-400.
16. HOLMES, S. J. Phototaxis in the Sea Urchin, *Arbacia punctulata*. *J. of Animal Behav.*, 1912, 2, 126-136.
17. HURWITZ, S. H. The Reactions of Earthworms to Acids. *Proc. Amer. Acad. Arts and Sci.*, 1911, 46, 67-81.
18. LEFEVRE, G., and CURTIS, W. C. Reproduction and Parasitism in the Unionidæ. *J. of Exper. Zool.*, 1910, 9, 79-115, 3 plates.
19. MCCLENDON, J. F. Ein Versuch, amöboide Bewegung als Folgeerscheinung des Wechsels des elektrischen Polarisationszustandes der Plasmahaut zu erklären. *Arch. f. d. ges. Physiol.* (Pflüger), 1911, 140, 217-280.
20. MAST, S. O. Habits and Reactions of the Ciliate Lacrymaria. *J. of Animal Behav.*, 1911, 1, 229-243.
21. MAST, S. O. The Reactions of the Flagellate Peranema. *J. of Animal Behav.*, 1912, 2, 91-97.
22. MATULA, J. Die Regulation der Atemrhythmik bei *Squilla mantis*. *Arch. f. d. ges. Physiol.* (Pflüger), 1912, 144, 109-131.
23. METALNIKOW, S. Contributions à l'étude de la digestion intracellulaire chez les Protozoaires. *Arch. Zool. expér. et gén.*, 1912, 49, 373-499.
24. PARKER, G. H. Nervous and Non-nervous Responses of Actinians. *Science*, 1912, 35, 461-462.
25. PARKER, G. H., and PARSHLEY, H. M. The Reactions of Earthworms to Dry and to Moist Surfaces. *J. of Exper. Zool.*, 1911, 11, 361-363.
26. PIÉRON, H. Contribution à la psychologie du Poulpe. *Bull. Inst. gén. psych.*, 1911, 11, 111-119.
27. PROWAZEK, S. von. Einführung in die Physiologie der einzelligen Protozoen. Leipzig, Berlin, 1911. Pp. 172.
28. SCHMID, B. Ein Versuch über die Wärmeempfindlichkeit von Zoea-Larven. *Biol. Centralbl.*, 1911, 31, 538.
29. SCHMID, B. Ueber den Heliotropismus von *Cereactis aurantiaca*. *Ibid.*, 1911, 31, 538-539.
30. ÚLEHLA, V. Ultramikroskopische Studien über Geisselbewegung. *Biol. Centralbl.*, 1911, 31, 645-654; 656-676; 689-705; 721-731.
31. WAGER, H. On the Effect of Gravity upon the Movements and Aggregation of *Euglena viridis* Ehrb., and Other Microorganisms. *Phil. Trans. Roy. Soc.*, London, 1911, B, 201, 333-390. Pls. 32-36.

32. YUNG, E. De l'insensibilité à la lumière et de la cécité de l'Escargot des vignes (*Helix pomatia* L.). *C. r. Acad. Sci.*, Paris, 1911, 153, 434-436.

RECENT LITERATURE ON THE BEHAVIOR OF THE HIGHER INVERTEBRATES

BY C. H. TURNER

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TROPISMS

Heretofore it has been thought that all of the Hepialidæ fly only at night. Last summer, on the northern slope of Mt. Hood, J. McDunnough (29) found *H. hyperboreus* flying about in the sunlight, between half past two and three o'clock in the afternoon. This was not an accident, for the same behavior was observed on three successive afternoons. McDunnough thinks the severe cold of the evenings in that latitude has caused a change in the habits of the species.

By throwing large flat corks into an aquarium in which the water was only one inch deep, H. H. P. and H. C. Severin (36) obtained proof that *Belostoma americanum*, *Benacus griseus*, *Nepa apiculata*, *Ranatra americana*, and *Ranatra kirkaldyi* are positively thigmotactic. Thirty-two out of thirty-five specimens were found hiding against the under-side of the corks.

Cornetz (10) thinks the response of ants to light is a tropism.

Turner (40) conducted a series of experiments upon the light reactions of a parasitic bee of the family Stelidæ which caused him to form the following conclusions: "These bees are endowed with a pronounced tendency to move in the direction of the rays of light and towards their source, but they do not invariably so act. Light, heat, hunger, sexual restlessness and, perhaps, other factors arouse in these bees an impulse to roam from home. Coupled with this impulse to roam, there is an instinctive tendency to seek freedom in the direction of the rays of light. When following this instinctive tendency fails to bring freedom, the bee tries other methods. In this endeavor many bees make haphazard flights in all possible directions; while others, in a more systematic manner, hover repeatedly before the sides of the enclosure. If such behavior can be called a tropism, then these bees are positively phototactic."

SENSATIONS

The sense of touch of the water-bugs mentioned above is well developed; for, according to the Severins (36), the slight disturbance caused by touching a needle to the water near a hungry bug is responded to immediately. These investigators announce that the ability of these bugs to see moving bodies is quite pronounced.

Recently three investigators, working independently, have conducted experiments which convince them that bees possess color vision. These investigators are: Allard (6), Lovell (25), and Turner (38).

Allard's (6) experiments were conducted in the midst of a cotton field. He tested the tendency of certain bees (*Mellissodes bimaculata*, *Bombus*, *Entecnia*, *Apus*) to visit each of the following things when arranged in various combinations of threes: normal cotton blossoms, cotton blossoms with the petals removed, petals only of a cotton blossom pinned carelessly to a stem, cloth petals of an artificial rose so arranged as to simulate a cotton blossom, artificial cotton blossoms made out of the petals of an artificial rose covered with natural cotton petals, cotton blossoms made out of paper, single cotton petals pinned to a stem, leaves of cotton so wrapped about cotton petals as to resemble a cotton bud. The three specimens used in any one experiment were arranged either so as to form a triangle or else in a straight line. Allard records the following conclusions: (1) Once visiting insects have entered a cotton field, there is little doubt that their visual powers enable them to discover the blossoms. (2) The size and general appearance of the blossoms do not appear to be of great importance in initiating the process of inspection. (3) A blossom concealed except to bees directly above it is seldom visited. (4) Bees are rarely induced to inspect paper or cloth artifacts; this is probably due to perceptual differences in color and texture. (5) The actual number of entrances into a blossom are small compared with the number of inspections. (6) Bees usually inspect the surface very carefully; hence, although the corolla of the blossom invites the first approach, it is not easy to determine the relative importance of the sense of sight and of the sense of smell involved in nearer inspection. (7) Conspicuousness and coloration are important factors in leading bees to perceive cotton blossoms. (8) A sort of memory of association is developed, so that older or much experienced bees often appear to work among blossoms to a much better advantage than younger bees. The American cotton possesses extra-floral nectaries, but the Asiatic does not. Bees collecting nectar from the outer involucre

nectaries of the American cotton visit similar structures of the Asiatic, but soon depart. Allard thinks a sort of odoriferous cloud enables the bees to find the field itself; but he gives no experimental evidence to support the view.

Lovell's work (25) is partly statistical and partly experimental. He states that, in the portion of the United States which lies east of the 102d meridian and north of North Carolina and Tennessee there are 1,244 species of green or dull-colored flowers, only 233 of which are entomophilous; and many of these are capable of self-fertilization. In his experiments the bees were given an opportunity to select conspicuously colored flowers from dull-colored ones, flowers with corollas from blossoms with the petals removed, colored blossoms from green leaves supplied with honey, honey-bearing surfaces contrasting with the environment from honey-bearing surfaces harmonizing with the environment. The following conclusions are the results of his experiments: (1) Green flowers are not well adapted to entomophily, and many such plants have been derived from larger and more highly developed entomophilous forms. As a whole, entomophilous green flowers are sparingly visited by insects of the less specialized families, and, as a rule, they retain the power of self-pollination. (2) The fact that insects have been observed feeding on over-ripe fruit, or on the glandular secretions of the vegetative organs of plants, or on the excretions of the Aphidæ, or on foliage, or on greenish or brownish flowers, or on dull-colored receptacles which have contained sugar or sweet liquids, affords no proof that conspicuousness is not an advantage to entomophilous flowers. Any surface, whether it is bright or dull-colored, on which there is nectar or honey will be freely visited by bees for stores, after these liquids have once been discovered; but they will not be discovered so quickly on a surface which does not contrast in hue with the environment as they will be on one that does so contrast. (3) As pointed out by Knuth, in the absence of control or comparative observations, the experiments of Plateau upon green or greenish flowers are fallacious and do not prove that "all flowers might be as green as their leaves without their pollination being compromised." (4) When, under similar conditions, bees are given the choice between a conspicuous and an inconspicuous object, they exhibit a preference for the former. This preference is sufficiently marked to account for the development of color contrast in flowers.

Turner's experiments (38) on the pattern-vision of bees were conducted with paste-board artifacts similar to those used by him, a

year ago, in his experiments upon the color-vision of bees. Artifacts constructed out of seven different kinds of color patterns were used. The bees were trained to collect honey from an artifact of a certain definite color pattern. The trained bees were given an opportunity to select artifacts of that color-pattern from one or many artifacts of different color pattern, under the following three conditions: when the artifact to be selected contained honey and the others did not; when some of all kinds of artifacts contained honey; when none of the artifacts contained honey. Of the 518 selections made by the bees, 508 were correct. This warrants the conclusion that bees can distinguish color-patterns. Hence since bees can distinguish colors and the fine details of color-pattern, there is nothing about the visual powers of bees that militates against the theory that the colors and the color-patterns of flowers are adaptations to insect visitors.

FEELINGS AND EMOTIONS

H. H. P and H. C. Severin (36) find that a sudden approach to an aquarium containing *Belostomas* causes the bugs to flee in all directions from their resting places. This they consider an indication of fear. Under similar conditions, *Nepa apicula* um, *Ranatra americana*, and *Ranatra kirkaldyi* show no such signs of fear.

Wodsdalek (44) thinks that, under certain conditions, the may-fly larvæ show unmistakable signs of fear. He found that larvæ which had been frequently handled exhibited this type of behavior in a marked degree.

Hardy (19) thinks he has discovered in the wasp *Diamma bicolor* signs of anger. He bases this conclusion upon the following observation. The wasp was dragging a cricket into its burrow when Hardy, with a pair of forceps, held the cricket by its hind legs. After tugging and tugging without accomplishing anything, the wasp suddenly stopped pulling, mounted the cricket, seized a portion of the cricket's abdomen in her jaws and stung the insect three times.

MATING INSTINCTS

Hinds and Turner (23) find that the rice weevil is both polygamous and polyandrous.

In studying the behavior of *Calosoma sycophanta*, Burgess (8) found that the same beetles copulated several times during the summer.

Cory (14) describes in detail the copulation of *Sanninoidea exitiosa* Say. He finds that they remain in copulo from 51-82 min.

Fuchs (17) observed two males copulating with one female *Cheimatonia brunnata*. He also noticed a male *Larentia bilineata* copulate with a female *Acidalia aversa*.

Turner (40) describes in detail the mating of a parasitic bee of the family Stelidæ.

That certain syrphid flies hover before flowers for long stretches of time, and that several other flies engage in a kind of an aerial dance in which all heads are directed the same way, has been known for several years. Some have considered the first an indication that flies have an æsthetic taste; most students have considered the latter an anemotropism. When Plateau interposed his hand between the fly and the blossom and noticed that it continued to hover there, and when he moved his hand to the right and to the left, forward and backward, and noticed that, in each case, the fly moved in the same sense, he demonstrated the fallacy of the æsthetic taste hypothesis. Pérez (32) has now proposed what, to the writer, seems the true interpretation of both of the phenomena mentioned above. He noticed that the flies hovering before flowers and those engaged in the dances were always males. Whenever a female approached one or more of the males would dart after her. If the female was overtaken, mating would occur and the male would drop out of the dance. These data, obtained by watching the behavior of several species of flies, caused Pérez to conclude that the stationary hovering of certain flies and the aerial dances of others were means of securing mating. This discovery of Pérez places the stationary hovering of the Syrphidæ, the aerial dances of other flies, and the sun dances of certain bees in the same category; each is what has been called a "nuptial ambushade."¹

NEST BUILDING AND MATERNAL INSTINCTS

Girault (18) describes the behavior of the adult and larval *Polistes pallipes* Lepelletier during the process of colony formation.

Lozinski (26) discovered a nest of ten cells, constructed by *Osmia bicornis*, in an open glass tube.

Sasscer (35) describes the method of ovipositing of the saw-fly *Tomosthetus mullicinctus* Rohwer.

Hinds and Turner (23) describe the egg-laying habits of the rice weevil.

Parrott (30) describes, in detail, the method of ovipositing of the tree crickets, *Oecanthus niveus* DeGeer, *O. quadripunctatus* Beut., *O. nigricornis* Walker.

¹ C. H. Turner, "The Sun-Dance of Melissodes," *Psyche*, 1908, pp. 122-124.

Calvert (9) found the larvæ of *Mecistogaster modestus* living in water between the leaves of epiphytic bromelids. He thinks this is an evolution from the chance laying of eggs in the bromelids when floods brought the water to that level. The association having once been formed persists, so he thinks, even after the plant is far above the water.

Turner (39) has observed an American *Ammophila* stocking its nest with subterranean caterpillars.

It is not often that one has the good fortune to observe, within the range of a single genus, an epitome of the evolution of an instinct. In *Synagris*, a genus of Eumenidæ found in the Congo, Roubaud (33) has made such a discovery. *S. calida* L. constructs a nest of several mud cells, stocks them with caterpillars, lays an egg in each, seals the cells, and takes no further care of them. *S. sicheliana* Sauss. lays an egg in each of several mud cells, places in each enough caterpillars to last the larva a little more than a day, and renews the supply daily. When *S. cornuta* L. has completed one cell, she lays an egg in it; but does not stock the cell with caterpillars. When the larva has hatched, the wasp feeds it daily until it is full grown. Then she seals the cell and proceeds to construct a new one.

FIGHTING AND FOOD-PROCURING INSTINCTS

Hardy (19) describes, in detail, the capture and the handling of a tree cricket by *Diamma bicolor*.

Gowdey (1), of Uganda, has observed two specimens of *Bembex tricolor* Dahl carrying off a *Tabanus secedens*.

Davidson (3) observed a large bug (*Lethocerus* (*Belostoma*) *americanus* Leidy) capture and feed upon a fish (*Lucius americanus* Gmelin).

Banks (7) discovered that one of the phorid flies attacks myriapods.

McDermott (28) observed a young half-winged bug feeding upon the larvæ of the tent-caterpillar.

Knab (24) discovers that a genus of mosquitoes (*Megarhinus*) does not suck blood, but feeds upon fruit and that its mouth-parts have been especially modified for that purpose.

According to the Severins (36) both *Belostoma* and *Nepa* are carnivorous.

PARASITISM, COMMENSALISM AND SYMBIOSIS

T. L. Patterson (31) has conducted some experiments which have caused him to conclude that the sarcophagids are scavengers and not parasites.

Roubaud (33) describes several commensals and parasites of the solitary wasps of the genus *Synagris*.

Wheeler describes two new ant guests: a pseudoscorpion (*Chalanops dorsalis* Banks) (41) and a coccinellid beetle (*Brachycantha quadripunctata* Mels.) (43) and gives a list of the hosts of five *Xenodusæ* (42).

Enslin (15) describes a small cicada (*Gargara genistæ*) functioning as an "ant cow." The larvæ and nymphs rest on a plant with the beak of each penetrating the plant tissues. The ant appears in the rear and feels the abdomen of the cicada with her antennæ. Immediately the cicada protrudes an anal tube on the tip of which appears a drop of clear liquid, which is swallowed by the ant.

Cremastogaster difformis Sm. (4), a Javanese ant, excavates its nest in the end of dead branches. In certain places these nests are filled with rain water and a mosquito (*Harpagomyia splendens* Meijere) breeds therein. In breeding mosquitoes and ants together, Jacobson found that the mosquitoes spent much time on the upright rod that supported the nest. When an ant passed between the legs of the mosquito, it was caressed by the mosquito and between the ant's wide open jaws there appeared a drop of liquid which was swallowed by the mosquito.

In the literature much emphasis has been placed upon the symbiotic relation of certain animals to certain plants. Recently Escherich (16) has made a careful study of the so-called symbiosis between ants and *Humboldtia laurifolia*, a plant with hollow internodes. He collected the following data: (1) Only a small number of the cavities in the stem contained ants. (2) The following genera of ants were found in the cavities: *Tapinoma*, *Monomorium*, *Cremastogaster*, etc., all genera that are found elsewhere than in the stems of these plants. (3) The ants were anything but aggressive. (4) Many of the branches containing ants showed scars caused by woodpeckers. Escherich concludes that this is evidently not a symbiotic, but a parasitic relation; the ants being the parasites.

MISCELLANEOUS INSTINCTS

Migrations.—Hill (22) describes dragon flies migrating in swarms.

July 9, 1911, a moth (*Tortrix fumiferana* Clemens) entered Philadelphia in such numbers as to interfere with traffic and to cause the shop people to close their doors (2).

Hibernation.—Herrick (21) thinks that, in the south, the agamic adults of the cabbage aphid (*Aphis brassicae*) hibernate.

HOMING

During the year Cornetz (10, 11, 12, 13) has produced several papers on the homing of African ants. These papers reiterate the same points given in the papers by him that were reviewed in this BULLETIN last year. He lays especial stress upon the statement that ants have an awareness of distance and of direction, which has been obtained independently of the sense of sight and of the sense of smell.

Santschi (34) has recently conducted a series of well-planned field experiments upon the African ants. These experiments were so arranged as to give the ants an opportunity to find the way home under the following conditions: when the odor has been removed from a portion of the trail; when a portion of the trail and the ant upon it is shifted bodily to a new position; when the direction of the impinging light rays is shifted from time to time by means of mirrors; when the ant is placed in a new environment. Santschi concludes: (1) There are two kinds of trails found among ants: trails along which the ants are guided by the olfactory and topochemical senses, and trails along which the ants are guided by perceptions which are largely visual. (2) Among the *Tapinomas*, and perhaps among other harvesting ants, the trails are started by odors intentionally deposited by a single worker. (3) Such an intentionally scented trail, although not slavishly followed, is utilized by workers to teach other workers the way to a source of food. (4) The trace of odor is not sufficient to explain fully the orientation of the ants that follow it and it is supplemented by contact ideas. (5) As a rule, orientation among ants is a complex phenomenon based upon a variety of sense stimuli, the one predominant depending upon the species and the conditions. (6) Odors, topochemical stimuli, visual images, the direction of the rays of light, tactile sensations, muscular sensations, and auditory sensations form a psychic complex which serves as a flexible guide to behavior. (7) The chief sense-organs that function in ant behavior

are: antennæ, eyes, tactile tegumentary hairs, chordotonal organs, and muscles.

MEMORY AND LEARNING BY ASSOCIATION

Allard (6) thinks that the bees visiting cotton blossoms display a kind of memory or association.

By patient experimenting, Wodsedalek (44) trained may-fly nymphs to move against the light towards a stone, the position of which was shifted from time to time, and to swim considerable distances towards food held in forceps. The latter was accomplished in the following manner. Algæ, held in forceps, were presented to a hungry nymph. When the insect seized the algæ, the experimenter pulled gently and thus caused the nymph to follow. Later he would hold bits of algæ near a nymph and, when the young may-fly approached, withdraw the forceps a little. After four weeks of such training, many would swim considerable distances towards food, and some would swim towards the experimenter as soon as he entered the room. At the end of two and a half months, as soon as Wodsedalek entered the room, the majority of the nymphs would swim towards him and claw against the side of the aquarium. One specimen came to the top of a stone, and partly into the air, to obtain the food. Untrained specimens never behaved in this manner.

Szymanski (37) has used the same method in investigating the behavior of young cockroaches that was employed by Yerkes in studying the behavior of mice; namely, punishing the subject with an electric shock whenever it makes a wrong choice. The young roaches were given an opportunity to pass from a well-lighted apartment into a dark one. Following its natural tendencies, each roach started to enter the dark chamber. As soon as it did so, it received an electric shock which caused it to dart back into the light. After being repeatedly punished for entering the dark chamber, the roach learned to turn back as soon as it reached the shadow. To the best of my knowledge, this is the first time that this electrical method of punishment has been used in the investigation of insect behavior.

REFERENCES

1. [ANON.]. *Bembex* Preying upon *Tabanidæ*. *Bull. Entom. Research*, London, 1911, 2, 182.
2. [ANON.]. *Entomological News*, 1911, 22, 371-372.
3. [ANON.]. *Entomological News*, 1911, 22, 372-373.
4. [ANON.]. *Entomological News*, 1911, 22, 466.
5. [ANON.]. Le retour au nid chez les Fourmis. *Le Naturaliste Canadien*. Quebec, 1911, 38, 29-31.

6. ALLARD. Some Experimental Observations Concerning the Behavior of Various Bees in their Visits to Cotton Blossoms. *Amer. Nat.*, 1911, 45, 607-622; 668-685.
7. BANKS, N. A Curious Habit of One of Our Phorid Flies. *Proc. Entom. Soc. Washington*, 1911, 13, 212-214.
8. BURGESS, A. F. *Calosoma sycophanta*: Its Life History, Behavior and Successful Colonization in New England. *U. S. Dept. of Agri., Bureau of Entomology*, Bull. 101, 1911, 1-94; Pls. I.-IX.
9. CALVERT, P. P. Habits of Plant-Dwelling Larva of *Mecistogaster modestus*. *Entom. News*, 1911, 22, 402-411.
10. CORNETZ, V. L'Oeil-boussole de la Fourmi d'après Santschi. *Revue des Idées*, 1911, Oct. 15, 1-7.
11. CORNETZ, V. Observations à faire à propos des trajets de la Fourmi. *La Feuille des Jeunes Naturalistes: Revue Mensuelle d'Histoire Naturelle*, 1911, 41, 1-6.
12. CORNETZ, V. Das Problem der Rückkehr zum Nest der forschenden Ameisen. *Zsch. f. Insektbiol.*, 1912, 7, 181-183; 218-223; 312-316; 347-350.
13. CORNETZ, V. Quelques observations sur l'estimation de la distance chez la Fourmi. *Bull. de la Société de l'Afrique du Nord*, Feb. 15, 1912.
14. CORY, E. N. Notes on the Egg-Laying Habits and Emergence of Adult *Sannioidea exitiosa* Say. *J. of Econ. Entom.*, 1911, 4, 332-336.
15. ENSLIN, E. *Gargara genistæ* F. and *Formica cinerea* Mayr. *Zsch. f. wiss. Insektbiol.*, 1911, 7, 19-21; 56-58.
16. ESCHERICH, K. VON. Zwei Beiträge zum Kapitel "Ameisen und Pflanzen." *Biol. Centralbl.*, 1911, 31, 44-51.
17. FUCHS, F. Unnatürliche Copula bei Lepidopteren. *Zsch. f. wiss. Insektbiol.*, 1911, 7, 359-360.
18. GIRAULT, A. A. Incidental Observations on a Queen of *Polistes pallipes* Lepelletier while Founding a Colony, Including Fragmentary Biological Notes. *Bull. Wis. Nat. Hist. Soc.*, 1911, 9, 49-63.
19. HARDY, A. D. The Stinging of *Gryllotalpa coarctata* by *Diamma bicolor*. *Victorian Naturalist*, 1911, 28, 33-38.
20. HERMS, W. B. The Photic Reactions of Sarcophagid Flies, Especially *Lucilia cæsar* and *Calliphora vomitoria*. *J. of Exper. Zool.*, 1911, 10, 167-226.
21. HERRICK, G. W. The Cabbage Aphis (*Aphis brassicæ*). *J. of Econ. Entom.*, 1911, 4, 219-224.
22. HILL, M. D. *Entom. News*, 1911, 22, 419-421.
23. HINDS, W. E., and TURNER, W. F. Life History of the Rice Weevil (*Calandra oryza* L.) in Alabama. *J. of Econ. Entom.*, 1911, 4, 230-236; Pl. VII.
24. KNAB, F. The Food-Habits of Megarhinus. *Psyche*, 1911, 18, 80-83.
25. LOVELL, J. H. The Color Sense of the Honey Bee: The Pollination of Green Flowers. *Amer. Nat.*, 1912, 46, 83-107.
26. LOZINSKI, P. Ueber einen eigentümlichen Nestbau von *Osmia Bicornis*. *Zsch. f. Insektbiol.*, 1911, 7, 223-230; 316-322.
27. LUND, E. J. On the Structure and Use of Photogenic Organs, with Special Reference to the Lampyridæ. *J. of Exper. Zool.*, 1911, 10, 415-468.
28. McDERMOTT, F. A. The Attack of a Larval Hemipter upon a Caterpillar. *Proc. Entom. Soc. Washington*, 1911, 13, 90-91.
29. McDUNNOUGH, J. Peculiar Habits of a Hepialid Moth. *Canadian Entom.*, 1911, 43, 289-292.

30. PARROTT, R. J. Oviposition among Tree Crickets. *J. of Econ. Entom.*, 1911, 55, 216-218, Pl. VI.
31. PATTERSON, T. L. Investigations of the Habits of Certain Sarcophagidæ. *U. S. Dept. of Agriculture, Tech. Series*, No. 19, part III., 25-32.
32. PÉREZ, J. Sur quelques particularités curieuses du rapprochement des sexes chez certains Diptères. *Bull. Scientifique de la France et de la Belgique*, 1911, 7th Series, 45, 1-14.
33. ROUBAUD, E. The Natural History of the Solitary Wasps of the Genus *Synagris*. *Ann. Rept. Smith. Inst. for 1910-1911*, 507-526. Pl. 1-4.
34. SANTSCHI, Dr. F. Observations et remarques critiques sur le mécanisme de l'orientation chez les Fourmis. *Rev. Suisse de Zool., Ann. de la Société Zoologique Suisse, etc.*, 1911, 19, 304-338.
35. SASSCER, E. R. Notes on a Sawfly Injurious to Ash. *Proc. Entom. Soc. Washington*, 1911, 13, 107-110, Pl. VII.
36. SEVERIN, H. H. P. & H. C. Habits of *Belostoma* (= *Zaitia*) *flumineum* Say and *Nepa apiculata* Uhler with Observations on Other Closely Related Aquatic Hemiptera. *J. of N. Y. Entom. Soc.*, 1911, 19, 99-108.
37. SZYMANSKI, J. S. Modification of the Innate Behavior of Cockroaches. *J. of Animal Behav.*, 1912, 2, 81-90.
38. TURNER, C. H. Experiments on Pattern-Vision of the Honey Bee. *Biol. Bull.*, 1911, 21, 249-264.
39. TURNER, C. H. A Note on the Hunting Habits of an American *Ammophila*. *Psyche*, 1911, 18, 13-14.
40. TURNER, C. H. Notes on the Behavior of a Parasitic Bee of the Family Stelidæ. *J. of Animal Behav.*, 1911, 1, 374-392.
41. WHEELER, W. M. Pseudoscorpions in Ant Nests. *Psyche*, 1911, 18, 166-168.
42. WHEELER, W. M. Notes on the Myrmecophilous Beetles of the Genus *Xenodusa*, with a Description of the Larva of *X. cava* Leconte. *J. of N. Y. Entom. Soc.*, 1911, 19, 163-169.
43. WHEELER, W. M. An Ant-Nest Coccinellid (*Brachycantha quadripunctata* Mels.). *J. of N. Y. Entom. Soc.*, 1911, 19, 169-174.
44. WODSEDALEK, J. E. Formation of Associations in May-Fly Nymphs *Heptagenia interpunctata* Say. *J. of Animal Behav.*, 1912, 2, 1-19.

RECENT LITERATURE ON THE BEHAVIOR OF VERTEBRATES

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Fish.—Copeland (2) finds that the puffer bites much oftener at packets containing food than at empty packets of similar appearance; this discrimination is abolished by cutting the olfactory nerves, and reestablished on their recovery.

Loeb and Wasteneys (13) have observed that the maximum temperature to which *Fundulus* may safely be transferred varies with

the concentration of the water and is affected by the presence of salts. The fish may be immunized to a temperature of 35° by being previously kept for thirty hours in water at 27°.

Sumner (23) has observed the protective adjustment of the markings of flatfish to the background. Observations were made with the fish on natural and artificial grounds. The pigment pattern is adjusted not only to the brightness of the ground but to its pattern: the plates show arrangements to correspond with large and with small black and white checks; arrangements quite foreign to the previous experience of individual or race. The pattern assumed is constant for a given ground. The vertical walls have some influence; the ceiling has none. The pigment changes do not occur if both eyes are destroyed; hence their source is retinal. Since the absolute degree of illumination has little effect, the stimulus must be the ratio of direct to reflected light. The changes occur when the fish is buried in the sand or has its skin covered with a mask. The fish shows no ability to choose between two grounds that one to which its pigmentation is adapted. It may be remembered that Minkiewicz has claimed such a power for the crab, but that Pearse has been unable to confirm his observations:

Parker (16) has recently made experiments to test the effect on various kinds of fish, which he believes can hear, of the noises made by motor boats and guns. It was found that "the sounds produced by motor boats are extremely faint under water, and have little influence on the movements and feeding of fishes. . . . Single explosive sounds, like the report of a gun, may startle fish and cause them to cease feeding, but these responses are also temporary and local." It is pointed out that certain fish, like the drumfish and the squeteague, produce noises that are connected with sex attraction, and that therefore it might be possible to use artificial noises as a lure.

A very interesting suggestion, connecting the adjustment of pigmentation in certain fishes to the background on which they lie, with possible sensibility of their eyes to color, has been made by von Frisch (6). *Phoxinus laevis* has this power of adjustment, but loses it if blinded, showing that the reaction is a retinal one. Now two equally bright fish may be placed, the one on a gray, the other on a yellow ground, and if the grounds are properly chosen, the fish will not change their brightnesses, showing that the two grounds are of equal brightness so far as the sensitiveness of the fish is concerned. But after a few hours spent on these grounds, the fish on the yellow shows a yellow stripe which does not appear on the other fish. This

proves, von Frisch argues, that the light has had a chromatic effect on the retina. If such is the case, there is no reason why the fish should not have color vision. This is drawing evidence from a new source on the problem of color-vision in an animal (see the dispute between Hess and Bauer reported in the corresponding number of this BULLETIN for last year).

Amphibia.—Our opinion of the ability of frogs to learn has been raised by the investigations of Schaeffer (19). Specimens of *Rana clamata*, *R. sylvatica*, and *R. virescens* learned in from four to seven trials to avoid hairy caterpillars, and chemically treated worms also were soon avoided. An electric shock associated with food inhibited the feeding instinct altogether for some days. Schaeffer calls attention to the fact that the frogs learned to avoid the disagreeable food in two ways: either by taking it into the mouth and rejecting it, or by swallowing it. In the former case, rejecting movements entered into the formation of the habit; in the latter case, the habit must have been formed wholly in nervous tissue, and under such circumstances a habit might appear to be suddenly formed when its growth had really been gradual though invisible. The difference between the speed of learning shown by his frogs and the slowness of Yerkes's frogs in learning a labyrinth the author explains as due to the fact that the feeding instinct, which was not involved in the work of Yerkes, is exercised with regard to a great variety of dissimilar stimuli, and hence its mechanism must be very plastic. Strong objection is made to the statement by Washburn and Bentley in their article on the formation of associations in the chub: "In general it may be prophesied that the more deep-rooted and essential the instinct appealed to by the experience to which an animal is subjected, the more rapidly will the animal profit by experience." The authors of this statement did not mean to imply that these characters in an instinct were the only ones affecting its modifiability. The presence of a psychic accompaniment to the behavior of his frogs is concluded by Schaeffer from the fact that they very carefully examined the food supplied to them, after they had had unfavorable experience with it. This examination differed from instinctive examination, for its cause was the individual experience of the frog. The nature of this psychic process the author describes by using Morgan's term "defining the construct" of hairy caterpillar.

In connection with prophecies that fail, it is rather amusing to find in Hargitt's (8) paper on the tree frog a prophecy that is falsified by Schaeffer's results. Hargitt observed that a tree frog which had

caught and been stung by a wasp went through the same performance next day without, apparently, having profited by its lesson, and he says: "It may be doubted whether amphibia show any particular discrimination based on that type of experience." Hargitt's work was done on the American species *Hyla versicolor*, and was supplemented by a less complete study of the European *H. arborea*. The animals were subjected to varying degrees of daylight, and to different air and water temperatures. Strong light lightens the skin color, as does high temperature: Parker found that in lizards light and high temperature caused opposite effects. Neither darkness nor low temperature had any direct effect on the tree frogs. Biedermann's hypothesis that contact stimuli are important was tested with different stimuli, as well as with individuals whose toe disks were clipped off, and even with section of the spinal cord; the results were negative. The great variability of the phenomena observed leads Hargitt to think that emotional factors are involved in their production. Sometimes mere handling would produce the changes. "I even," says he, "tried the effect of merely close scrutiny without any jostling or moving of the jars, and found that where a specimen could be brought to *observe* that it was observed, there was often a color change quite as evident as the others." In certain instances where light stimuli on one day produced response and on the following day failed to do so, the suggestion is ventured that "the creature had acquired such familiarity with conditions as to dissipate to a degree its emotional sensitiveness." One can imagine the reaction of Professor Loeb to the following concluding remark, which is however very gratifying to the psychologist: "There are other minds than ours, and they share something in common with us in those psychic powers which count for something in the stress of evolution, and as behavior in its manifold aspects gives expression to the endless struggle it is not strange to find involved therein the psychic along with other factors which go to constitute the organism and its environment."

Cummings (5) contributes a brief description of the courting behavior of a British salamander, *Molge palmata* Schneid.

The spotted newt has had its food and chemical sense tested by Reese (17). In securing food, both sight and smell play a part, the latter being more important. Inedible objects are followed and sometimes seized, but not swallowed; and when fatigued so that it will no longer follow such objects the newt will usually still react to food. The head is much the most sensitive part of the body to chemical

stimulation. All other parts of the body are equally sensitive. Cutting the olfactory nerves abolished all response to food, but a negative response to a .5 per cent. solution of acetic acid was unchanged, and the greater sensitiveness of the head was maintained, from which the author concludes that it is probably due to the sensitiveness of the oral and nasal mucous membranes, rather than to smell proper. A strong sugar solution caused no reaction. Quinine produced a negative reaction when applied to the head, but no response from other regions. Some animals reacted negatively to a 1 per cent. solution of common salt applied to the head; a 4 per cent. solution was necessary to produce reactions from other parts of the body. Very marked negative reactions to potassium hydroxide and to acetic acid occurred. Ethyl alcohol caused less reaction than might have been expected. Cocaine has apparently no effect upon the skin of this newt; applied to the nasal and oral mucous membrane in a 5 per cent. solution "it temporarily inhibits the feeding reaction and diminishes the sensitiveness to acid solutions squirted upon the head. This result may be due to the general effect of the cocaine upon the system." The writer quotes from the present reviewer the term "telæsthetic sense" as descriptive of the chemical sense. The term, which is Lloyd Morgan's, should be "telæsthetic taste," and is descriptive of the sense of smell in a water-dwelling animal. "Telæsthetic sense" does not properly describe smell, for the senses of sight and hearing are also telæsthetic.

Birds.—Hunter (11) used three mazes with pigeons; the first was that of Rouse, the second more complex, and the third was one whose paths could be shortened. Four males and four females were given three tests each a day. With Rouse's maze, the time curves began much lower and fell more abruptly than in Rouse's own experiments; probably because in his tests the birds could see from one compartment into another, since he used wire rather than wood partitions. Hunter found that memory for this maze was practically perfect after four weeks. With the second maze the error curve fell much more slowly, owing, the author thinks, to the complexity of the maze and to the interference of habits from the first maze. The time curves, however, fell more rapidly in the case of those birds that had had experience with the first maze. Tests were made with the maze rotated 90°, 270°, and 360°. Some birds were confused at 90° but perfect at 270°; with others the reverse tended to be the case. One bird was confused at both positions. "After sixteen days training in these two positions, all the birds were perfect at 360° rotation."

In explanation, Hunter suggests that the birds which were not confused in a rotated position must have been depending on visual cues from within the maze, while those which were confused were depending on visual cues from without the maze. It is then necessary to suppose that those which were confused at one rotation but not at another changed their system of cues when the maze was placed in a new position, an hypothesis which "suggests the complexity of the animal mind for types as high as the pigeon." The final perfect records at 360° may be explained either by a persistence of the original learning, or by the acquisition of a system of cues that is undisturbed by any rotation. The birds throughout depend on visual cues and do not make the type of errors in the shortened maze, such as butting into the walls, characteristic of an animal guided by kinæsthetic data.

In the second part of Herrick's (9) study of nests and nest-building in birds, we have sections on the analysis of increment nests on the basis of behavior, and on variations in the nests of certain birds. In Part III. careful descriptions are given of the building behavior of the robin, oriole, and red-eyed vireo. An interesting feature of the robin's building is the fact that the molding movements are always made in opposite directions on successive visits to the nest, although nothing can be detected in the appearance of the nest that would give the bird a clue as to which direction she had turned in at the previous visit. The history of the nest-building instinct is outlined as follows: incubation arose through the instinct to guard and to conceal by covering with the body; "increment nests may have arisen . . . through an earlier practice of collecting materials of any description to cover the eggs upon leaving them to look for food. All such would be scattered to some extent upon reëntering the nest to cover and guard; some, however, would remain to form a rude rampart or wall of circular form, and this would be advantageous in holding the eggs to a focal point."

Haggerty (7) notes an instance of pure instinct in a young sparrow hawk which had fallen out of the nest, and which used towards a piece of roast beef the behavior that would have been appropriate for living prey.

The series of Behavior Monographs is inaugurated by Breed's (1) study of the instincts and intelligence of the chick. Part I. is devoted to the chick's instinctive activities. The behavior of the chick while still in the shell was observed by bringing the eggs, just after the shell was chipped, under an electric light and breaking away some of the shell. Breed is inclined to think that a movement much more

important than pecking in the emergence from the shell is a lifting movement of the head. "Chicks appeared to break the shell in two by a lifting, struggling movement of the head accompanied by a stretching, straightening movement of the legs." A tapping sound is heard before the shell is chipped at all, but a somewhat similar sound is heard after so much of the shell has been removed that the beak is no longer in contact with it. Morgan and Mills agree that the stimulus to the drinking reaction is the touch of water on the bill. Breed, by keeping chicks from drinking for three days after hatching, found that the drinking reaction was given "to the surface of smooth white note paper, the edge of white glazed kymograph paper, or the edge of a glass dish;" the stimulus being evidently visual. The effect of deferring the pecking reaction was studied by keeping some chicks in the dark for a number of hours after hatching; it was found that pecking was decidedly more inaccurate in these chicks, but that practice soon made up the deficiency. The effect of imitation on the pecking reaction was studied by comparing the records of accurate pecking made by one brood with those made by a younger brood placed with the older one to profit, if possible, by imitating the latter. No such beneficial influence was observed. Possibly, the author suggests, the effect of social influence may have been exerted in the direction of increasing the intensity and speed of the pecking, though not its accuracy. An important observation is that the chicks ate readily in complete darkness. One of the fundamental methods upon which Hess's far-reaching conclusions with regard to vision in the lower animals are based is derived from the assumption that if animals cannot see food on the ground they will not eat it. There must, however, be some explanation for the refusal to feed, under certain visual conditions, shown by the animals in the tests made by Hess, Katz, and Revész. A very careful record of the development up to the twenty-fifth day of the pecking reaction as regards the accuracy of its three components, striking, seizing, and swallowing, was kept. Improvement was very rapid during the first two days, and was practically complete at the eleventh day. Seizing remained imperfect longer than the other components. The belief of some observers that the reaction is perfect from the outset is probably accounted for by the fact that the striking component is very nearly so by the fifth day, and is "seldom widely erroneous."

In Part II. we have a report of the learning processes of the chick as tested by the visual discrimination method. Two compartments were offered, through one of which escape might be made to

the cage where the other chicks were kept and food was to be had. Cards were placed at the entrance to the compartments to serve as visual stimuli. Electric shocks furnished the punishment for wrong choices. Color differences, brightness (black-white) differences, form differences, and size differences, were used as stimuli. The principal object was to study the learning process, and the results bearing on this will be stated first; the incidental observations on color discrimination will be discussed later. The chicks succeeded in acquiring habits of choosing one color or brightness rather than the other, and in responding selectively to a small and a large opening, through which they had to pass in order to escape. They failed to discriminate forms, either as figures pasted on the cards, or as differently shaped openings. The doctrine of formal discipline fails to be confirmed, in so far as learning to discriminate black and blue did not facilitate learning to discriminate sizes. "Of nine chicks perfectly trained in black-blue, five made perfect persistence tests after an interval of thirty days." On the whole, the chicks that learned most rapidly remembered longest. The use of the electric shock tended to produce a negative response to the stimulus to which it was attached, rather than a positive response to the other stimulus.

The principal conclusions with regard to color vision which the author considers indicated by his experiments are two: that blue has a very light brightness value for the chick, and that it has a color value as well. The first conclusion is based on the fact that one chick which preferred white to black and yellow to black preferred blue to yellow and to orange; while another chick that had been trained to choose black rather than white preferred black to blue but displayed no preference between blue and white. Although the reviewer found indications that the rabbit, too, sees blue as much lighter than the human subject does, she does not feel sure that the number of tests given by Breed (in many cases only ten) was sufficient to exclude chance and establish the fact of a preference. That blue is seen as a color is argued from the fact that chicks which had been trained to avoid blue in the black-blue combination avoided blue in any combination, even with white; the inference being that if absolutely recognized, it must have been seen as a color. But it is not to be assumed as certain that an animal cannot recognize an absolute brightness to a certain extent; that is, that the gray seen in place of a blue cannot be identified and avoided in successive experiments. In the experiments of Washburn and Abbott (26) there was some indication that a gray was thus identified. And in Breed's experi-

ments there may have been other peculiarities than either color or brightness leading to the identification of the blue cards: were the same cards used whenever blue was employed as a stimulus?

Strong (22) has combined an anatomical study of the smell organs in birds with an experimental test of the possibility of causing smell to influence a bird's behavior through association. The morphological study was carried out on material representing twenty-seven out of the thirty-five existing orders of birds. From it the writer concludes that "the olfactory organs of birds are of too great size to be set aside as non-functional," but that as one passes from the lower to the higher orders of birds there is a tendency towards retrogression in these organs. The crow family, sometimes considered to be the highest birds, show extremely minute smell organs. "The sense of smell has evidently been disappearing in birds with the great development of vision. It seems not at all improbable that the sense of smell may be practically lost in the passerine birds." The fulmar, a bird which takes long sea-flights, has enormously developed olfactory apparatus, suggesting Cyon's hypothesis that it may be used for orientation. It will be remembered that Watson, testing this hypothesis for terns, got negative results. Strong finds, however, that the olfactory organs of the tern are very small, so that the use of those organs in guiding the flights of other birds is not ruled out by Watson's observations. Strong's experimental work was performed upon the ring dove. A labyrinth was used, with a large central chamber, and four small chambers, one opening from the middle of each side. Food could be placed in any one of the four small chambers and remain invisible from the central compartment. Currents of air could be sent from each of the four small chambers into the central compartment by means of a siphon arrangement outside each small chamber; the air currents entering one of the four chambers were passed through a bottle containing an odorous substance. General ventilation was provided by an air-pump connected with an exhaust funnel in the middle of the roof of the labyrinth. To test the actual diffusion of the odor from the small chamber into the large one, the following method was adopted. The strength of the odor of an ammonia solution was compared with that of the smell of bergamot which was to be used in the experiments, and when the two were judged equal, the ammonia was placed in one of the odor bottles and its diffusion tested with wet litmus paper. It was found that the odor was diffused in a semicircular area whose radii converged at the entrance of the odor chamber, and whose front extended

to the region of the exhaust funnel. Tests were also made by the experimenter, lying on the floor inside the enclosure; the odor of bergamot could be detected eighteen inches from the point of emergence. The central chamber was five feet square. Oil of bergamot was the smell stimulus chosen for use, although less satisfactory tests were made with cologne, musk, and violet sachet; and food was to be found in the small chamber from which the odor emerged. The birds had previously been accustomed to the apparatus. The results showed that when bergamot was used, the percentages of choices of the odorous chamber rose for all four birds tested considerably above the twenty-five per cent. which chance would produce. It is to be regretted that only the total percentages are stated, rather than the choices of each successive day, so that no data on learning are furnished. The conclusion that the birds were stimulated by the bergamot seems warranted. That general sensation is not concerned the author infers from the small amount of odorous material that was used as a stimulus. A few observations on birds at liberty and in a zoölogical garden are also reported, but the results are not conclusive.

Craig (3) has been continuing his studies of the vocal expressions of emotion in pigeons. The paper on those of the mourning dove was written chiefly, the author tells us, as a basis of comparison for that on the passenger pigeon. Most of the peculiarities of the latter bird can be traced to its extreme gregariousness. The softer, cooing notes of this pigeon, for instance, which could not have much effect in a noisy and populous community, have degenerated, and the louder sounds have developed into "shrieks, chatters, and clucks." Two females not infrequently lay in the same nest, an occurrence which is much rarer in less social species. The testimony of various observers is quoted to show that orphan young are fed by foster-parents. The courting behavior of these birds is described as much rougher than that of other pigeons.

The interesting discovery has been made by Craig (4) that egg-laying in the female ring-dove may be produced by the courting behavior of the male, without actual fertilization. "The influence of the male in inducing oviposition is a psychological influence." The word "psychological" is perhaps a little extreme here: the tactile stimuli produced by the male's preening of the head and neck of the female might operate reflexly.

Mammals.—Slonaker (21) has investigated the activity, growth, and longevity of the white rat. Eight rats were chosen and divided

into two equal groups; the members of one group were placed in revolving cages whose revolutions were registered on a kymograph; those of the other group were kept in ordinary cages as controls. The results show that the daily activity increases rapidly during the first third of the animal's life and then decreases gradually until death. The change in the amount of the daily activity is rhythmical. During youth and old age the activity is more or less distributed through the twenty-four hours; in middle life it is nocturnal. The female is much more active than the male; the males are much heavier. About three-fourths of the whole amount of work done during the animal's lifetime is done before reaching middle age. During the last 30 per cent. of life only one-eighth of the total work was performed. The unexercised males are much heavier than the exercised ones, and reach their maximum weight at an earlier age. The exercised rats had shorter lives than the unexercised ones; they were more active, alert, and bright in appearance.

Hunter (12) records the observation that two white rats which had been accustomed to being dropped into a box as a preliminary to being returned to their living cage and to food at the close of certain experiments with them, after two hundred and four days of this experience dropped themselves into the box. This is in opposition to the results obtained by Thorndike with cats, which did not learn to drop themselves into a box after being dropped in by the experimenter. Cole, on the other hand, found that raccoons did display this type of behavior. The inability of Thorndike's cats to perform such an act was taken as evidence against their possession of an idea of being in the box as a preliminary to food. The reviewer's work on the rabbit (26) furnished proof that these animals after only a few days' experience of being dropped into a box between tests will jump in of their own accord and wait for the next test. Hunter rightly points out that this behavior is not necessarily evidence of ideas: "the very perception of the box has acquired motive power."

In the study by Hoge and Stocking (10) comparing punishment and reward as motives, albino and black and white rats were used. The punishments were light electric shocks; the reward was milk-soaked bread; the problem was brightness discrimination in a Yerkes box. It was found that punishment produces quicker learning than reward, and a combination of the two is most effective of all.

Rockwell (18) describes the behavior of a ground squirrel which tried to go through the motions of climbing up the support that had led to her nest, after the support and the nest had been removed.

Warren (25) tells of a cat which after several years of failure to imitate another cat's trick suddenly did so.

Washburn and Abbott (26) attempted to find by the use of colored and gray papers whether any brightness could be found that would be indistinguishable from gray to the light-adapted eye of the rabbit. The apparatus was a box with two compartments, each opening by a swing door on the front of the box. The papers were pinned rather than pasted on the doors, to avoid identification by wrinkles, and were changed from experiment to experiment. In the red and gray experiments the door carrying the red paper could be pushed open; the gray door was closed by a button on the inside. Food was in both compartments. To avoid identification of the papers by their intrinsic odor a narrow slit was cut in each at the level where the rabbit's nose touched it in pushing, and a piece of the other paper was placed under the slit. The red or open door was in alternate sides in succeeding experiments, but the rabbits showed no trace of acquiring a kinæsthetic habit of alternating from side to side in their choices. The rabbits learned to discriminate Bradley red paper from Hering gray, numbers 7, 15, and 24, but failed to discriminate it from a paper of the brightness of Hering gray number 46, which is almost black. The results thus agree with those of Yerkes on the dancing mouse and Watson on the monkey, in showing a low stimulating power of red on the retina of the rabbit; and give no proof that red is seen as a color. Some experiments were also made on the brightness value of Bradley saturated blue paper. The results were less conclusive, but gave indications that its value is decidedly lighter than for the human eye, a result which may be compared with the similar observation made on Breed's chicks. "To a certain degree, the rabbit is able to form a habit of choosing the darker of two impressions, irrespective of their absolute brightness." In one series the same gray was presented sometimes with red, in which case it was on the closed door, and sometimes with white, in which case it was on the open door. The rabbit tested chose the gray only 27 per cent. of the time in tests of the first type, and 72.8 per cent. of the time in tests of the second type. Some identification of the absolute brightness of a gray seems to occur, however. The rabbit uses monocular more than binocular vision.

Swift (24) has obtained associations with tone sensations in a dog whose temporal lobes had been destroyed. These reactions, he thinks, in opposition to Kalischer, are not reflexes, since they were learned; and their location must therefore have been in the cortex, though not in the temporal lobe.

Discussion of von Máday's (14, 15) articles on the horse is deferred until a recently published book by this writer, summing them up, can be obtained for review.

Shepherd (20) found that three raccoons, which were repeatedly made to watch another raccoon go up an inclined plane and get food, failed to show any signs of inferential imitation when tested alone.

REFERENCES

1. BREED, F. S. The Development of Certain Instincts and Habits in Chicks. *Behavior Monographs*, 1911, 1. Pp. 78.
2. COPELAND, M. The Olfactory Reactions of the Puffer or Swellfish, *Spheroides maculatus* (Block and Schneider). *J. of Exper. Zool.*, 1912, 12, 363-369.
3. CRAIG, W. The Expressions of Emotion in the Pigeons. II. The Mourning Dove (*Zenaidura macroura* Linn.). III. The Passenger Pigeon (*Ectopistes migratorius* Linn.). *The Auk*, 1911, 28, 398-427.
4. CRAIG, W. Oviposition Induced by the Male in Pigeons. *J. of Morph.*, 1911, 22, 299-303.
5. CUMMINGS, B. F. Some Features of Behavior in the Courtship Display of the Palmate Newt (*Molge palmata* Schneid.). *J. of Animal Behav.*, 1911, 1, 305-307.
6. FRISCH, K. VON. Ueber den Farbensinn der Fische. *Verhandl. d. deut. zool. Gesellschaft*, 1911.
7. HAGGERTY, M. E. A Case of Instinct. *J. of Animal Behav.*, 1912, 2, 79-80.
8. HARGITT, C. W. Behavior and Color Changes of Tree Frogs. *J. of Animal Behav.*, 1912, 2, 51-79.
9. HERRICK, F. H. Nests and Nest-Building in Birds. Part II. *J. of Animal Behav.*, 1911, 1, 244-278. Part III. *Ibid.*, 336-374.
10. HOGE, M. A., and STOCKING, R. J. A Note on the Relative Value of Punishment and Reward as Motives. *J. of Animal Behav.*, 1912, 2, 43-51.
11. HUNTER, W. S. Some Labyrinth Habits of the Domestic Pigeon. *J. of Animal Behav.*, 1911, 1, 278-305.
12. HUNTER, W. S. A Note on the Behavior of the White Rat. *J. of Animal Behav.*, 1912, 2, 137-142.
13. LOEB, J., and WASTENEYS, H. On the Adaptation of Fish (*Fundulus*) to Higher Temperatures. *J. of Exper. Zool.*, 1912, 12, 543-557.
14. MÁDAY, S. V. Das Orientierungsvermögen des Pferdes. *Zsch. f. angew. Psychol.*, 1911, 5, 54-87.
15. MÁDAY, S. V. Zur Psychologie des Pferdes und des Reitens. *Ber. IV. Kongress f. exper. Psychol.*, 1911, 274-279.
16. PARKER, G. H. Effects of Explosive Sounds, Such as Those Produced by Motor Boats and Guns, upon Fishes. *Bureau of Fisheries*, 1911, Document no. 752. Pp. 9.
17. REESE, A. M. Food and Chemical Reactions of the Spotted Newt, *Diemictylus viridescens*. *J. of Animal Behav.*, 1912, 2, 190-209.
18. ROCKWELL, R. B. Peculiar Actions of a Striped Ground Squirrel. *J. of Animal Behav.*, 1912, 2, 218-222.
19. SCHAEFFER, A. A. Habit Formation in Frogs. *J. of Animal Behav.*, 1911, 1, 309-336.

20. SHEPHERD, W. T. Imitation in Raccoons. *Amer. J. of Psychol.*, 1911, 22, 583-585.
21. SLONAKER, J. R. The Normal Activity of the Albino Rat from Birth to Natural Death, its Rate of Growth and Duration of Life. *J. of Animal Behav.*, 1912, 2, 20-43.
22. STRONG, R. M. On the Olfactory Organs and the Sense of Smell in Birds. *J. of Morph.*, 1911, 22, 619-658, 2 pls.
23. SUMNER, F. B. The Adjustment of Flatfish to Various Backgrounds. A Study of Adaptive Color Change. *J. of Exper. Zool.*, 1911, 10, 409-507.
24. SWIFT, W. B. Psychological Results in Reactions to Tone Before and After Extirpation of the Temporal Lobes. *J. of Animal Behav.*, 1912, 2, 225-228.
25. WARREN, E. R. Delayed Imitation in a Cat. *J. of Animal Behav.*, 1912, 2, 222-225.
26. WASHBURN, M. F., and ABBOTT, E. Experiments on the Brightness Value of Red for the Light-Adapted Eye of the Rabbit. *J. of Animal Behav.*, 1912, 2, 145-181.

SPECIAL REVIEWS

ANIMAL INTELLIGENCE

The Evolution of Animal Intelligence. S. J. HOLMES. New York: Henry Holt and Company, 1911. Pp. v + 296.

An advance announcement of this book reads: "A general account of the evolution of animal behavior from the mollusc and crustacean up to apes and monkeys. The critical point of the transition from instinct to intelligence receives special treatment. One of America's leading scientific authors who saw the manuscript before publication writes: 'Holmes's is the best of the lot, and on the whole, the most interesting because it gives the most *facts*, that is, examples, illustrations, hence animal behavior, incidents, stories, etc. Holmes is immensely well informed.'" The reviewer admits that he was somewhat prejudiced against Professor Holmes's book by this publisher's announcement. He was also rendered curious, and when the book came into his hands he read it at a sitting with intense interest and keen enjoyment. His immediate reaction was to ask the students of an introductory course in comparative psychology to read the book entire. The result was quite as gratifying to the instructor as important for the class, for without exception the men were delighted with Professor Holmes's description of the development of intelligence.

Some weeks later the book was reread more carefully and critically by the reviewer in preparation for the present writing. Naturally, many defects were discovered and the reviewer's judgment concerning the scientific value of the work was somewhat modified.

Professor Holmes has offered an essay on the evolution of intelligence, not a treatise. His book is rather popular in style, sketchy, and introductory to the subject. In spite of the fact that it is poorly written, it is extremely readable, even fascinating to one who is interested in the problems of mental development. For the author appreciates these problems; he has observed animal behavior intensively; he has read widely and he has pondered well the relations as well as the significance of his facts. Unlike most popular essays on scientific subjects, this one has value for the specialist as well as for the general reader.

The Evolution of Animal Intelligence outlines the course of mental development through the discussion of reflex actions, the tropisms, the behavior of the Protozoa, instinct, non-intelligent modifications of behavior, pleasure-pain and the beginnings of intelligence, and the types of intelligence which appear in the arthropods, the lower vertebrates, the mammals, and the primates.

There is nothing noteworthy from the scientific standpoint in the introductory chapters, which deal with reflexes and tropisms, but in connection with his account of behavior in the Protozoa Professor Holmes makes clear his attitude toward tests of intelligence. He is doubtful whether any investigator has thus far satisfactorily demonstrated associative memory in a unicellular organism. "While granting the possibility that future work may compel us to modify our conclusion," he writes, "it may be said that, thus far, there is no unmistakable evidence that the protozoa are capable of forming true habits or of learning by association" (p. 89). Unfortunately for the reader, this discussion of the educability of the Protozoa is not preceded by such a definition of habit formation and of associative memory as would prepare him to react critically to the author's statements.

The two chapters which are devoted to the description of instinct and of its evolution are decidedly unsatisfactory to the reviewer. They fairly well present many of the essential facts concerning instinct and, in a conventional way, they offer an account of the chief theories of the origin of instinct, but they lack the freshness and originality which are characteristic of most parts of the book.

In his chapter on the evolution of instinct, the author quotes with apparent approval the following words of Professor C. O. Whitman: "Instinct precedes intelligence both in ontogeny and in phylogeny, and it has furnished all the structural foundations employed by intelligence." At the beginning of the next chapter he quotes, with approval one must infer, Father Wasmann's words: "Both elements, automatism and plasticity, are found in different proportions with all animals from the highest to the lowest." To the reviewer it seems that instinct is one form of automatism and that intelligence is an expression of plasticity. Evidently the author would not accept this statement, for he repeatedly asserts that intelligence has developed from instinct. It certainly is fair to object that the view of Professor Whitman which receives Professor Holmes's support and which he at one point says is commonly accepted by psychologists (p. 164) is not the only view which may be defended.

As it happens, the reviewer numbers himself among those who do not conceive of intelligence as having developed from instinct.

In his account of modifications of behavior, the author points out that there are certain modifications which should be considered non-intelligent. Indeed he states that certain forms of modifiability are probably coextensive with animal life and that, if we accept these modifications as intelligent, we must admit that even the cells of the multicellular organism are intelligent. Intelligent behavior, we are told, differs from non-intelligent behavior in that the former involves "associations" (p. 164). These associations, the author states, are in some cases associations of sense experiences with acts which are either pleasurable or painful. In other cases they are associations of ideas. The former of these associations represent a much lower stage in the development of intelligence than do the latter. At some points in Professor Holmes's description, it is not clear whether he accepts the association of sense impressions with affective experiences as a form of intelligence. For example, on page 181 he writes: "In the Coelenterata behavior, although of the reflex type, is often highly plastic and capable of being modified in many ways as the result of previous experience; but while intelligence has often been claimed for these forms, there is, in the opinion of the writer, no case in which the formation of associations is satisfactorily proven." Either in this statement the author has misused the word "experience," or he has contradicted himself. Similar contradictory statements might be quoted from other portions of the book; and fairly strong support might be adduced for the statement that the author has not with sufficient clearness defined such important terms as habit, association, associative memory, and intelligence.

In the chapter on primitive types of intelligence in crustaceans and molluscs, Professor Holmes thus briefly sums up the results of studies which have been made concerning the educability and intelligence of the invertebrates. The Protozoa furnish no evidence of ability to acquire associations. The Coelenterata present no convincing evidence of the formation of associations. "The same statement may also be risked for . . . the Vermes. The behavior of Echinoderms is certainly complex and plastic to a remarkable degree, but even in this group the power of forming associations is very doubtful." In the Crustacea and the Insecta the existence of intelligence is admitted and numerous examples are offered of intelligent modes of behavior. Indeed the activities of certain crustaceans and insects are most effectively described in chapters 9 and 10. In

the latter chapter, Professor Holmes has written (p. 201): "We are certainly justified in concluding that insects are not mere reflex machines incapable of learning by experience. They can form associations very quickly in many cases. They give evidence of memory. They have a remarkable ability for retaining impressions of topographical relations. We may not be compelled to admit that they have ideas, but it must be granted, I think, that a wasp which after cutting a caterpillar in two and carrying away one part, came back and searched diligently for the remainder, retained somehow an impression of the missing part and its location. If out of sight it was not out of mind."

The intelligence of the lower vertebrates is interestingly characterized by the presentation of the results of a number of studies of fishes, amphibians and reptiles. It is pointed out that associations (intelligence) do not necessarily depend upon the cerebral cortex. A careful comparison of many of the statements which appear in the author's chapter on intelligence in the lower vertebrates with statements in his chapters 7, 8, and 9 is likely to leave the reader in doubt concerning the physiological and psychological characteristics of intelligent acts and even more so concerning their structural relations.

The examples of different modes of behavior, non-intelligent and intelligent, which make up the greater part of this book are admirably chosen and, in addition to giving the reader the impression of extensive knowledge on the part of the author, they serve to acquaint him with many of the most important facts which the study of behavior has revealed. It is perhaps unfortunate that Professor Holmes in his account of the intelligence of the apes should have chosen Professor Witmer's description of "Peter" to represent the intelligence of the chimpanzee. For Peter, it should be remarked, was a trick animal whose behavior was observed only after many months of training, and even then for only brief periods. Had the author given the matter further consideration, he would doubtless have concluded that concerning behavior of whose history in the individual we know nothing we can say little with safety. Whether it is intelligent or non-intelligent, whether it is indicative of the presence of ideas or of images cannot be decided. One might compare the behavior of Peter, as it is described by Professor Witmer, with the behavior of such a trained horse as Clever Hans, the observer of whose performances would be likely to make inferences regarding the degrees and types of intelligence of the horse which in the light of a careful study of the development of the animal's behavior are amusing.

The Evolution of Animal Intelligence presents particular facts in abundance and generalizations and theories in such fashion as to inform the reader and, at the same time, suggest interesting problems. The book contains little concerning the methods of studying animal behavior and it will prove more useful to those who desire a sketch of behavior than to those who desire to learn how to observe it or how to solve specific problems concerning intelligence.

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Animal Intelligence: Experimental Studies. E. L. THORNDIKE. New York: The Macmillan Co., 1911.

The present volume consists mainly of various previously published papers, a few of which have been for some time out of print. In thus bringing together his contributions in the field of animal psychology, Dr. Thorndike has rendered a service for which students of this subject have reason to feel grateful. However they may be inclined to differ from the conclusions of the author as to the nature and limitations of the animal mind, they must needs recognize the important part that his investigations have played in the development of our knowledge of animal psychology.

While Dr. Thorndike has added many interesting facts concerning the behavior of animals, the value of his work lies not so much in his contributions to knowledge as in the example of his method. Since the appearance of the monograph on *Animal Intelligence* in 1898 the labyrinth and the puzzle-box have been the favorite apparatus for testing the mental capacity of the animals studied. The numerous experimental studies which followed close upon the investigations of Dr. Thorndike have been carried out, for the most part, in a more careful and critical manner than that which formerly prevailed in the study of the mental life of the higher animals. The crusade against anecdotal psychology and the undue exaltation of the intelligence of animals was a wholesome influence which was perhaps all the more potent on account of the somewhat extreme position of the author. And if several of the negative conclusions to which Thorndike was led have not been upheld by later investigators, the positive conclusions which the latter have drawn are based on a more adequate foundation as a result of applying the methods of study that Thorndike employed. William of Occam's razor is an unsafe instrument in the investigation of the mental life of animals, but it is one whose constant employment is nevertheless unavoidable.

Besides the monograph on Animal Intelligence, the volume contains an introductory chapter on The Study of Consciousness and the Study of Behavior, and chapters entitled The Instinctive Reactions of Young Chicks, A Note on the Psychology of Fishes, The Mental Life of the Monkeys, Laws and Hypotheses of Behavior, and The Evolution of the Human Intellect. The introductory chapter and the chapter on Laws and Hypotheses of Behavior are new. The first consists essentially of a discussion of the proper subject matter of psychology. Thorndike joins issue with those who would limit psychology to the consideration of consciousness. As a matter of fact such a limitation is never made in practice, however desirable it may be deemed in theory; the phenomena of behavior and those of conscious life are so closely interwoven that it is impracticable to deal with them separately, and psychology must perforce continue to occupy itself with both sides of the impassable cleft that separates states of consciousness from their physiological concomitants.

In the chapter on Laws and Hypotheses of Behavior there is considerable matter for reflection. There are two laws of the modification of behavior which, according to Thorndike, are of especial value in explaining higher manifestations of mental activity. The first, or the law of effect, is that acts which bring satisfaction tend to be repeated, while those which produce pain tend to become discontinued, the strength of the connections formed being proportional to the intensity of the resulting feelings and the smallness of the interval of time by which they are separated from the act that produced them. The second principle, the law of exercise, is that "any response to a situation will, other things equal, be more strongly connected with the situation in proportion to the number of times it has been connected with that situation and to the average vigor and duration of the connections."

Satisfaction and discomfort are admitted to be but very roughly correlated with what is favorable and unfavorable respectively to the animal. What is sought after and produces satisfaction may at times be deleterious, but Thorndike states that "upon examination it appears that the pernicious states of affairs an animal welcomes are not pernicious *at the time, to the neurones*. We may learn bad habits, such as morphinism, because there is incomplete adaptation of the body state to the temporary interest of its ruling class, the neurones."

Direct evidence that pleasure-giving and pain-giving experiences are related in these ways to the welfare of the neurones is not adduced,

but the conclusion is incorporated as an element of a further hypothesis to explain the law of effect. The modifications of behavior which this law formulates involve changes in the connections between neurones, probably at the synapses, so that certain lines of communication are rendered more permeable than others. Those connections are made more permeable which result in favoring the life processes of the neurone, and those are weakened which result in impeding these processes. It naturally follows that "learning by the law of effect is thus more fully adaptive for the neurones in the changing intimacy of whose synapses learning consists, than for the animal as a whole." Profiting by experience through forming associations rests upon the adaptive behavior of the neurones.

This interesting hypothesis of Thorndike involves, as do most hypotheses concerning the problem of learning, a number of unproven assumptions. It may be questioned if the law of exercise may not be capable of a simpler explanation without appealing to a selective activity on the part of the neurones, or any primary tendency to seek the welfare of these elements.

The discussion of the preceding laws paves the way for the consideration of imitation which may be explained, according to Thorndike, "by the laws of instinct, exercise and effect." The important conclusion is drawn that "the idea of a response is in and of itself unable to produce that response," imitation in all cases, except those of the purely instinctive type, being the indirect outcome of the pleasure-pain type of behavior. The connections established by reasoning fall under the same far-reaching principles of explanation.

Adequate discussion of the fundamental questions raised in this chapter would require more space than can be devoted to them here. The treatment of these questions which Dr. Thorndike has given cannot fail to be suggestive and stimulating both to the general psychologist and the special student of animal behavior.

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THE PSYCHOLOGICAL BULLETIN

GENERAL REVIEWS AND SUMMARIES

MEMORY, IMAGINATION, LEARNING, AND THE HIGHER MENTAL PROCESSES (EXPERIMENTAL)¹

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I. MEMORY AND IMAGINATION

(a) *Summaries and Systematic Treatises*.—Several years ago Professor G. E. Müller (38) began an investigation of a most remarkable case of supra-normal memory. During the progress of the experiments the author has been led far beyond the specific problem which he set himself at the outset; and we are promised a three-volume treatise describing and discussing the experimental findings, together with an evaluation of various points dealing with experimental procedure and a critical consideration of numerous questions which bear upon memorial and ideational theory. Colvin's book (11) is essentially a summary of the results which have been yielded from various investigations of the *Lernprozess*, together with an indication of pedagogical applications. Starch (50) has compiled a number of judiciously selected experiments from the field of experimental pedagogy, to which he has added several ingenious variations of his own. Offner's monograph (39) has appeared in a second edition in essentially unchanged form.

Ranschburg's Innsbruck *Sammelreferat* (47) is a review of recent findings in the psychopathology of memory. He points out the crudities of Freud's interpretation of the phenomena in this field,

¹ The writer is indebted for aid in the preparation of this paper to Miss S. C. Fisher and Dr. K. J. Karlson, of Clark University, and to W. S. Foster and C. A. Ruckmich, of Cornell University.

and shows that the recognized principles of associative and reproductive inhibition, associative coëxcitation, and the like furnish a much more adequate explanation of the common defects of memory. The methods of investigating memory are described and discussed; and the memorial characteristics of normal and various types of abnormal subjects are presented.

(b) *Discussions of General Questions.*—Henry's monograph (17) is based upon an elaborate mathematical treatment of a meager group of experimental data. Memory and habit are to be regarded as wholly disparate phenomena. Memorial functions are never performed successfully at the first attempt,—the failure being due to the fact that one's idea of the act is at first imperfect, and becomes perfect only as the result of repetition. In the case of habit, however, the idea of the act to be performed is complete from the outset.

Bühler (6) describes a method employing spatial relationships for memorial material. A sheet of paper is divided into thirty-six small squares, the vertical and horizontal diameters of the sheet being indicated by heavy lines. Each small square stands in a definite relationship to each of the four large squares; and a total of 1,265 spatial relationships may be differentiated upon the sheet. A given relationship, indicated by the colored contents of certain squares, is presented, learned, and reproduced, with introspections. Fischer (13) outlines a programme for the investigation of creative imagination, which includes the following problems: a description of its sphere (play, empathy, fantasy); a determination of the boundaries of this sphere, and of its relation to the sphere of the real and serious; a classification of the typical forms of creative imagination.

Moede (37) discusses the use of the term memory in the biological sciences; he points out that the term has been divested of its essential characteristics by the biologists, who then apply it in this emasculated connotation to designate certain purely biological phenomena. Even the laws of heredity and of analogous biological phenomena are held by the author to be only superficially analogous to the characteristic laws of memory. Jesinghaus (22) résumés the traditional theories of memory, and discusses the phenomena of perseveration, forgetting, and feeling of familiarity.

(c) *Imagery.*—Angell's report (3) evaluates the various tests of imagery, and adds ingenious methods from his own laboratory. None of the purely objective tests prove to be trustworthy; the author's recommendations include a complete series of tests for the whole range of mental functioning. Feuchtwanger's paper (12) reports an

investigation of the same question. His problem was essentially a comparison of results obtained by introspective and objective methods.

Meumann (35) urges the consideration of a hitherto unrecognized factor in our enumeration of ideational types. Certain individuals are able to deal efficiently with ideational material only when the imagery from each sense department is present in isolation; they are unable to make use of joint imagery from different senses. Lipmann (31) believes that in our enumeration of types of apprehension we should differentiate, within the visual type, between those individuals who best apprehend size, position, color tone, etc.

Schaub (48) finds that images (visual, auditory, tactual) possess the attribute of intensity. The difference between image and sensation is not one of intensity, but rather one of texture and context, the image being incomplete, abbreviated, and without kinæsthetic context. Lobsien (32) reports a series of results from which he concludes that auditory memory is equally well developed in girls and in boys, and that it increases uniformly and progressively with increase of age.

(d) *Association and Inhibition*.—Langfeld (28) investigated the effect of alcohol (30 ccm., 95 per cent., in 60 ccm. water) and caffeine (6 gr. in capsule) upon association, reproduction and suppression. Pictures were shown, and the reagents were instructed that in their choice of a reaction-word they must not name the picture. Neither drug had any appreciable effect other than to decrease the association-time. The reagents did not translate the negative into positive instructions, *i. e.*, there was a distinct negative attitude, which was usually describable in terms of cortical set. Experiments with pathological patients revealed no deviation from normal accuracy of reproduction or normal power of suppression excepting in certain cases of dementia præcox. Jacobson (21) presented pairs of weights for comparison, and introduced intensive auditory stimuli in order to determine whether and to what extent it was possible to affect the judgment of the weights by thus inhibiting the sensation obtained from the comparative weight. In other experiments auditory stimuli were presented for comparison, and pressures constituted the distraction. It was found that pressures of moderate intensity are inhibited by simultaneous sounds and by other pressures, and that sounds of moderate intensity are inhibited by intensive simultaneous pressures. Increased attention to the inhibiting sensation increases the inhibition, while increased attention to the other sensation decreases

the inhibition. Hence what is called distraction of attention consists in an inhibitory influence of one sensation upon another; and degree of (subjective) intensity of sensation is a function of degree of attention.

Dauber (11a) found that the preferred association is related to the repeated association, and also to a number of other phenomena: the frequency with which the stimulus-word and the reaction-word occur in ordinary language; the phenomenon of clang association. Nonsense syllables tend to arouse meaningful reaction-words, in spite of instructions to react with nonsense words; and preferred associations appear in these responses to nonsense stimuli, indicating that preference is not merely a product of close associative connection between stimulus-word and reaction-word. Huber (19) investigated the influence of culture and environment upon the association-reaction, by repeating with a group of soldier reagents the experiments which had been made by Reinhold with school-girl reagents. The soldiers gave fewer preferred associations, more internal associations, more adjectival and definitive reaction-words. The author confirms Jung and Riklin's finding that uncultured reagents are more influenced by the meaning of the word and less by the word as such; and he concludes that the associations of a group of reagents is always influenced by the *milieu* of the group.

Foucault (15) brings forward empirical evidence, obtained in experiments with numbers and nonsense syllables, to show that association does not take place merely as the result of resemblance. Resemblance has no associative effect unless it is perceived as such by the observer; and when resemblance is perceived, we have a case not of mere association but of comparison and judgment. Resemblance therefore owes its potency to an intellectual act, and is *per se* no more efficacious than contrast and incompatibility, cause and effect, or means and end.

Levy-Suhl (29) aimed to determine whether the association-reactions of different forms of mental abnormality manifest typically different characteristics. Employing his data as a basis of classification, he divided his forty-four patients into four groups; and his psychological classification showed a remarkable agreement with a classification which had been based upon a clinical diagnosis. The first group gave an almost normal reaction; it included a convalescent case of exhaustion delirium and three cases of dementia paralytica. The second group (hyperprosexia) was characterized by a hypervigilance and a hypertenacity of attention; here appear ten cases of mania

and a (transitional) case of acute paranoia, together with five variants from the general group-type. The third group was characterized by selective hyperprosexia (sixteen cases of paranoia); and the fourth by hypervigilant reaction, with contamination and dissociation (four cases of dementia paralytica). Ley and Menzerath (30) also report the results of an investigation of various forms of mental abnormality, by means of the association-reaction but they supplement this method by introspection. They found that characteristic differences exist between the associations of normal and abnormal subjects; that the different forms of mental abnormality are each characterized by a typical sort of association-reaction; that the lengthened reaction is due to other causes than the presence of an emotional complex.

Woodworth and Wells (55) publish the report of the committee which was charged by the American Psychological Association with the evaluation and the standardization of association tests. The report consists essentially of a series of recommendations, with directions as to precautions to be observed and methods and materials to be employed. Wells (51) draws upon 12,000 observations in his discussion of certain properties of the free association-time. Women show greater individual variation, and greater variability from day to day, than men. The former give about twice as many judgment reactions, and fewer associations by subordination and superordination. Emotional coloring may cause lengthened reaction, but it is only one of many causes of associative obstruction; suppression, distraction, indecision, and the like, must all be taken into account. In another paper (52) Wells suggests the following categories for the classification of associations: egocentric; superordinate; contrast; speech habit; miscellaneous.

(e) *Learning and Forgetting*.—Abramowski (1) deals with the familiar phenomenon that one may fail to remember a datum while he remembers what it is not. This resistance of memorial lacunæ to being filled by erroneous data he refers to generic feelings, which he describes as being neither ideas nor definite feelings. Objects were placed upon the outstretched palms of blindfolded observers, who perceived them tactually either with concentrated or with distracted attention. In subsequent sittings, attempts were made to recognize the objects, various suggestions being introduced for the purpose of determining whether and to what degree erroneous suggestions would be resisted. The author concludes from these and from similar experiments in kinæsthetic perception that sensory impressions, even when divested of every intellectual element (by

distraction), are still retained in memory; and he finds in this fact a confirmation for his hypothesis of generic feelings. Joteyko (23) reports that in the learning of digits, syllables and words, her observers had recourse to various sorts of imaginal material, and that associated images were of prime importance. Pyle (45) found in his investigation of the immediate "substance" memory of twelve adults, that the rapid learner is more accurate than the slow learner, nor does the slow learner excel in immediate or in permanent retention.

Numerous investigators have reported that it is more economical to learn a given material as a whole than in piecemeal fashion. Is this equally true when the material is of excessive length? Pyle and Snyder (46) investigated this question, employing poetry as memory material, and assigning sections which varied in length from five to two hundred lines. They found that the *Ganzmethode* is invariably more economical, no matter how long the whole or the parts may be; and the saving is greater when the "wholes" are longer. They explain the disadvantage of the *Teilmethode* from the fact that it involves the formation of associations between the end of a section and the beginning of the same section, and the fact that the earlier sections are forgotten during the act of learning the later ones.

Ordahl (40) undertook to discover whether learning is aided by wholly or relatively unconscious factors, and whether the formation of a habit of whose existence one is unconscious can progress as well under distraction; and to discover what is the rôle of consciousness in the learning of simple tasks involving (a) almost no intellectual factor, (b) a complex coördination of motor impulses, (c) in learning of a purely intellectual character. Her experiments included the learning of nonsense syllables with unnoticed concomitants; the comparison of lifted weights, with and without distraction; writing in unusual ways; the mental multiplication of large numbers. It was found that: (1) unnoticed aids have no influence in the act of learning; (2) in learning simple muscular coördinations, where consciousness is normally focused on the end, learning can progress without consciousness either of the end or of the fact that one is learning, but a high degree of attention to the task gives better results than distracted attention; (3) in learning of every sort, both conscious and unconscious factors are present. Conscious control is most direct where the material is of an "intellectual" character. Consciousness is a corrective agent; it eliminates errors, improves on elements unconsciously developed, and organizes the whole procedure.

Can the different parts of speech be memorized and retained with equal facility? Busemann (7) employed nouns, adjectives, verbs, adverbs, and nonsense syllables. He found that consciousness of meaning is clearer in the case of nouns than in the case of adjectives and verbs, and that the retention of the former is correspondingly better. The author believes that the *Teilmethode* has not yet been shown to be more economical than the *Ganzmethode*.

Piéron (42, 43, 44) established the curve of learning and the curve of forgetting in the pond snail. Since the latter curve did not coincide exactly with that obtained by Ebbinghaus in the human subject, Piéron set himself the task of memorizing series of nonsense syllables, and found a confirmation of his own formula. He concluded from his experiments that the fixing of memorial traces continues after the stimulus has ceased to act, and that the duration of this fixing process varies widely in different animals. Where fixing progresses slowly, forgetting also progresses slowly.

(f) *Affection and Memory*.—Henderson (16) points out that in the simplest form of learning—trial and error—those movements which have disagreeable consequences are eliminated. We banish disagreeable reactions; do we really forget our disagreeable experiences? Ten observers were asked to record incidents from their lives, and to grade them into classes on the basis of their affective values. While his results show that remembrances are dominantly agreeable, the author does not believe that his query is to be answered in the affirmative. Peters (41) asked a number of reagents to respond to a stimulus-word by the reproduction of a past experience, and then to describe the affective coloring of the original incident and of the remembrance, together with details as to dates and frequency of recall. Fifty-two per cent. of the experiences were described as pleasant, recent experiences being less pleasant than earlier experiences. Individual differences were found in regard to preponderance of pleasant or unpleasant, and in regard to the constancy of the affective tone which attaches to a given experience in its successive revivals in memory.

Claparède (8) discusses the question as to whether an affective process can be an object of memory. Disagreement among psychologists is due to a failure to come to an understanding as to the definition and criteria of memory, and to a misapprehension regarding the significance of the evidence which they bring forward in support of their positions. The author differentiates the various functions or phases of memory, and concludes that only in the case of one of these, recognition, has the existence of affective memory been established.

(g) *Recognition*.—Alrutz (2) describes several remarkable experiences which consist in the false recognition of an acquaintance, but which are invariably followed a few minutes later by a meeting with the acquaintance who had been falsely recognized a few minutes previously. He discusses the various possible explanations of these phenomena, and concludes with the statement that in his opinion the telepathic hypothesis furnishes the most probable explanation,—*i. e.*, the acquaintance who is not yet within the range of the observer's vision is already perceived in vague fashion through the medium of a telepathic sense (!). Alrutz requests his readers to furnish him with additional reports of cases of false recognition.

Katzaroff's paper (25) contains a valuable classification and discussion of theories of recognition. His experimental procedure consisted in exposing a series of pictures, and in subsequently exposing a second series where the original pictures appeared among others of a similar character. The observers were asked to report whether or not they recognized the pictures of the second series, and if so with what degree of confidence. It was hoped by this means, and by means of the introspective records of his observers to throw light upon the process of recognition. The author concludes from his experiments that the process of recognition is a product of two separate and distinct factors, a feeling of familiarity, which constitutes pure or direct or immediate recognition, and the arousal of images or remembrances which confirm or control the immediate recognition and transform the latter into an indirect or mediated recognition. Recognition appears to be an affective rather than an intellectual process; in its pure form it is not determined by any associative process nor by the fusion or juxtaposition of imagery or remembrances. The certainty of one's recognition is independent of one's act of recognizing. Sometimes the former may be determined by the latter, and may follow immediately in its wake; but more often one's certainty develops during the progress of the recognitive process concomitant with the arousal of imagery, remembrances of details, verbal or other associations, and the like. The act of immediate recognition appears to be independent of all feelings or ideas of a precise localization in time or space, or of a precise localization in a constellation of remembrances. There is, on the subjective side, no qualitative difference between correct and erroneous recognitions. The process of recognition manifests such great individual variations that one is led to suspect the existence of typical differences in the mechanism of the process. Katzaroff's paper is followed by an

appendix by Claparède (8) who points out the similarity between Katzaroff's conception of the process of recognition and a view which Claparède himself formulated some years ago, as a result of certain pathological observations. This view makes relationship with the self (with *me* and *my* experience) the essential principle upon which recognition depends. The author assumes that mental associations are of two general sorts: connections of ideas with one another, and connections between ideas, on the one hand, and that which constitutes the self, on the other. These latter (egocentric) connections may function in a centrifugal direction,—constituting voluntary recollection,—or in a centripetal direction,—constituting recognition. Claparède illustrates and supports his view by citations from pathological observations.

Meumann (36) has observed in the course of his investigations with nonsense syllables that the feeling of unfamiliarity is much more definite than that of familiarity, *i. e.*, we are much more clearly conscious of the fact that an impression is unfamiliar than of the fact that another is familiar. Unfamiliarity is provided with a peculiar index or character which makes us aware of the unknown immediately and directly without the interposition of any act of reflection. It possesses the following characteristics: an inhibition of the motor and ideational processes; the consciousness of a blank; the feeling of unpleasantness; an absence of the ordinary reproductive flow of ideas. The experience of familiarity may come to consciousness in various stages or degrees: as the easier flow of mental processes, which gives rise in turn to characteristic feelings and organic sensations; as a lesser tension of attention; as a more ready flow of reproduction. Sometimes all of these criteria of the familiar are lacking, and still the conviction of familiarity arises, apparently as the result of physiological facilitation; but it seems more probable that even here a minimum of dimly conscious criteria have sufficed to give rise to the idea of familiarity.

II. INTELLECTUAL PROCESSES

Binet (5) differentiates emotions and intellectual acts as follows: Both are attitudes. But the attitude is emotional when it is accompanied by intensive organic sensations; and the more intensive its corporeal concomitants, the less doubt is there concerning the emotional nature of the attitude. The attitude is intellectual when it is accompanied by a minimum of subjective sensations and a maximum of objective sensations and images; it is less corporeal,

less material, apparently more worthy of pure mind. Intellectual phenomena seem to be less personal and more general; they are colder, farther removed from pleasure and pain. Emotions are more corporeal, more individual, more characterized by pleasantness and unpleasantness. To transform either attitude into the other, we need only change the group of concomitant organic sensations. Divest the attitude of its organic concomitants and you have left nothing but an intellectual act; clothe this intellectual act in a garb of organic sensations and you have an emotion.

Aveling (3*a*) aimed to determine: (1) What influence is exerted upon the sensorial content of percepts by the thought-processes which are involved in perception? (2) What influence is exerted upon the thought-character of perceptions by the sensorial content of percepts? (3) What influence is exerted by antecedent conscious processes upon the sensorial content and the intellectual character of perceptions? Colored pictures of familiar objects were presented tachistoscopically; and an attempt was made to predetermine the observer's perception by instructing him to perceive the picture, in one case as an individual thing, in another case, as the type of a class of similar things. In a series of control experiments, the observer was not instructed as to his mode of perception. The results show that in these control experiments, where no attempt was made to predetermine perception, the "individual" and the "type" perceptions occurred with equal frequency. Under "type" instruction, "type" perceptions occurred in seventy-five per cent. of the cases; and under "individual" instruction, "individual" perceptions also occurred in seventy-five per cent. of the cases, a fact which shows the degree to which a given consciousness may successfully be predetermined. The fact that the same picture is perceived in symbolic fashion by one observer, and in asymbolic fashion by another furnishes a basis for the classification of observers into types, since they seem, in the one case, to be in the presence of a real object, and in the other case, to be in the presence of a mere picture. This difference between observers seems to be due to different degrees in the facility with which previous experiences are assimilated into the present perception.

In Kakise's investigation (24) words and phrases were presented, in auditory or visual fashion, with a view to obtaining an introspective description of the conscious concomitants of understanding. It was found that the characteristic constituents of the meaning of a word or phrase are not selective experiences; they are rather a series of phases of a process of reproduction. If many such associations

of related past experiences are reproductively aroused, the result is a feeling of richness of content; when the number of reproduced associations is small, a feeling of poverty of content results; if there are no associations, a feeling of no content arises. This feeling of content, which is the awareness of the more or less fused aggregate of incipient associations, seems to be irreducible to specific imagery. The frequency of imagery in the understanding consciousness is primarily conditioned neither by the concrete or abstract character of the stimulus-word, nor by any peculiarity of the individual, but by the rapidity of his response. When the reaction-word came slowly and with difficulty, imagery tended to intervene; when reaction was prompt, imagery tended to be absent. The author is convinced that the association-method, as customarily employed, is too artificial to give satisfactory results; the *Ausfragemethode* seems to be better adapted both to the study of the general laws of association and to the study of individual peculiarities of association.

Hollingsworth (18) suggests that the failure of certain individuals to find that sensory components are present in their consciousness of relation, of intention, of purpose, and the like, may be due to the fact that they seek for relevant imagery. His own introspections convince him of the existence of thoughts whose character represents an intermediate between "the conventionally costumed idea and the nude relational process"; and he cites illustrations to show that three stages of this vicarious functioning may be differentiated. "The first stage includes dream states in which images quite irrelevant as to source or quality may be seen to play a symbolic or metaphorical rôle in the play of meanings, relations and complications of situation which make up the plot of the dream. The third stage is shown in the common observations that the vehicle of a waking meaning, the two poles of a relation, may be fragmentary, transitory, and only remotely relevant, relevant only by virtue of accidental association. The second stage is an intermediate one disclosed by observations of drowsiness hallucinations, a stage in which the thought process is a sensible and adequate waking affair, although the sensory content of consciousness may be evident dream material or even actual sensory impression of a quite foreign character."

Jacobson (20) investigated the perception of single letters, the understanding of words, and the understanding of sentences, employing the "method of examination." His observers were required to furnish two reports of each experience—a description of their conscious processes, and a statement concerning meanings, objects,

stimuli, and physiological occurrences. No imageless processes were reported; and he found that the correlated meanings and processes are two renderings, from different points of view, of one and the same experience.

Koffka (27) reports having asked a "catch question," in consequence of which a latent *Einstellung* was produced in his auditors, a fact which was shown by their changed attitude toward a second question. The author describes methods of investigating the laws of the latent *Einstellung*, and discusses the relation between this phenomenon and the *determinierende Tendenz*.

Clarke (10) attempted to analyze a number of typical *Bewusstseinslagen* by a method which consisted in obtaining introspections regarding the processes involved in learning to read type for the blind; in the understanding of the meaning of words, sentences, paragraphs; in the answering of questions, requiring and not requiring thought; and in the filling out of broken sentences ("rule of three"). It was found that the conscious attitude instead of being a mental ultimate is, in numerous instances at least, capable of being further analyzed, especially in the light of its genesis. When the attitudes occur often enough for generalization, there is found a marked agreement between different observers, and between the same observer's attitudes at different times. This is true of such attitudes as surprise, seeking, doubt, hesitation, uncertainty, all of which may be described in typically different terms. The same observer may report a graded series of transitions in his imagery, from vivid and explicit images to the vague and condensed consciousness which may be supposed to be analogous to that which has been called "imageless thought." Attitudes may, then, be analyzed into sensations, images and feelings, or their genesis may be traced to these elements.

Betz (4) cites illustrations to show that recognition may be a product not of imagery but of "*Einstellung*." Perception is ordinarily attended by a reaction which is essentially organic, kinæsthetic and affective in character. The subsequent reproduction of this reactive complex may serve to represent the perceived object in consciousness, and to give rise to a process of recognition. This revived complex is (inappropriately) called *Einstellung*, by Betz, in contradistinction to *Vorstellung*. The author refers our consciousness of similarity and identity to these organic, kinæsthetic and affective vestiges of original perceptions; and in a second paper, he invokes the same principle (together with the *vorgestellte Einstellung*) to explain the origin in consciousness of our concepts, our general ideas and our definitions.

III. PRACTICE, HABIT, TRANSFER

Foster (14) undertook to make a qualitative and quantitative determination of the relationship which obtains between "native" (or unpracticed) and practiced ability to evoke images of sensory experiences. Pictures, objects, and nonsense drawings were shown to three observers, whose immediate reproduction was then tested by their drawings or descriptions of the material. Practice was continued for three months. It was found that ability to reproduce increased with practice, rapidly at first, then more slowly; but in not a single instance did practice improve the ability to visualize or even increase the tendency to visualize. The improved efficiency in reproduction was found to be due to the following factors: increased confidence in ability to perform the task, and consequent increased attention to the task; increased familiarity with the material; the adoption of a more systematic procedure and a more economical distribution of attention during the act of learning; the discovery of subsidiary aids, such as counting, grouping, naming.

Kent (26) investigated the possibility of habit formation in dementia præcox. The procedure consisted in an attempt to obtain effects of practice. Eighteen women, representing various stages in the progressive development of the disease, were asked to practice a series of exercises for a period of several months. The exercises consisted in arranging a series of fifteen digits in a prescribed order, in tracing a path through a (printed) labyrinth, in crossing out digits, letters and geometrical figures. A second series of exercises consisted in placing pegs in holes in a board, and in fitting wooden blocks into a form-board. The records of the errors and of the times required for these exercises show that it is possible for the dementia præcox patient to acquire new habits as the result of practice, and that the results attained in one sort of exercise make themselves felt in other exercises of a similar motor sort.

Wells reports an investigation of the effect of practice upon the free association (53). He employed six normal observers; and the procedure consisted in obtaining reactions to one thousand stimulus-words,—twenty sittings, fifty reactions at each sitting,—and subsequently in obtaining a second set of reactions from the initial part of the original list of stimulus-words. It was found that the association-time tended to decrease toward a limit of approximately six fifths of a second; that the responses became further differentiated and generalized as a result of the increased readiness with which the reagent's whole vocabulary became available; that the forms of association

became more superficial; and that the emotive value of the associations decreased. The author mentions the fact that this last result diminishes the applicability of the association-method for any purpose where emotive value is involved.

Sleight (49) investigated the problem of the transfer of training in memorial acquisition. His procedure consisted in making an initial test of memorial ability (first "cross-section"), and then in practicing his observers in memorizing for a period of three weeks, when a second "cross-section" was made. Then practice was resumed for another three weeks, and a third "cross-section" was taken. His tests and his practice consisted in the memorizing of prose, poetry, nonsense-syllables, tables of arithmetical and geographical data, and in learning the "substance" of prose, and the like. His observers were divided into three groups; and the procedure was such that no group was tested by means of the same sort of material which had been employed in its training exercises. The results show that there appears to be no general memory improvement as the result of practice, nor any evidence for the hypothesis of a general memory function; that there would seem instead to be a very large number of related and unrelated memory functions; that the factors which contribute to the transfer of memorizing power are similarities of a fundamental nature, such as specific forms of attention, imagery, rhythm,—in short, similarities of procedure.

REFERENCES

1. ABRAMOWSKI, E. La résistance de l'oublié dans la mémoire tactile et musculaire. *J. de psychol. norm. et path.*, 1911, 8, 221-245.
2. ALRUTZ, S. Det falska igenkännandet ("La fausse reconnaissance"). *Psyke*, 1910, 6, Bilaga 1, 87-99.
3. ANGELL, J. R. Methods for the Determination of Mental Imagery. *Psychol. Monog.*, 1910., 13, 61-107.
- 3a. AVELING, F. The Relation of Thought-Process and Percept in Perception. *Brit. J. of Psychol.*, 1911, 4, 211-227.
4. BETZ, W. Vorstellung und Einstellung. I. Ueber Wiedererkennen. *Arch. f. d. ges. Psychol.*, 1910, 17, 266-296. II. Ueber Begriffe. *Ibid.*, 1911, 20, 186-225.
5. BINET, A. Qu'est-ce qu'une émotion? Qu'est-ce qu'un acte intellectuel? *L'année psychol.*, 1911, 17, 1-47.
6. BÜHLER, K. Ein Verfahren zur Untersuchung des Gedächtnisses für räumliche Beziehungen. *Ber. IV. Kongress f. exper. Psychol.*, 1911, 252-255.
7. BUSEMANN, A. Lernen und Behalten. *Zsch. f. angew. Psychol.*, 1911, 5, 211-271.
8. CLAPARÈDE, E. Récognition et moitié. *Arch. de psychol.*, 1911, 11, 79-90.
9. CLAPARÈDE, E. La question de la mémoire affective. *Arch. de psychol.*, 1911, 10, 361-377.
10. CLARKE, H. M. Conscious Attitudes. *Amer. J. of Psychol.*, 1911, 22, 214-249.

11. COLVIN, S. S. *The Learning Process*. New York: Macmillan, 1911. Pp. xix+336.
- 11a. DAUBER, J. Ueber bevorzugte Assoziationen und verwandte Phänomene. *Zsch. f. Psychol.*, 1911, 59, 176-222.
12. FEUCHTWANGER, A. Versuche über Vorstellungstypen. *Zsch. f. Psychol.*, 1911, 58, 161-199.
13. FISCHER, A. Methoden zur experimentellen Untersuchung der elementaren Phantasieprozesse. *Zsch. f. päd. Psychol.*, 1911, 12, 448-458; 497-507.
14. FOSTER, W. S. The Effect of Practice upon Visualizing and upon the Reproduction of Visual Impressions. *J. of Educ. Psychol.*, 1911, 2, 11-22.
15. FOUCAULT, M. Etude expérimentale sur l'association de ressemblance. *Arch. de psychol.*, 1911, 10, 338-360.
16. HENDERSON, E. N. Do we Forget the Disagreeable? *J. of Phil., Psychol. &c.*, 1911, 8, 432-437.
17. HENRY, C. *Mémoire et habitude*. Paris: Hermann et Fils, 1911. Pp. 116.
18. HOLLINGWORTH, H. L. Vicarious Functioning of Irrelevant Imagery. *J. of Phil., Psychol., &c.*, 1911, 8, 688-692.
19. HUBER, E. Assoziationsversuche an Soldaten. *Zsch. f. Psychol.*, 1911, 59, 241-272.
20. JACOBSON, E. On Meaning and Understanding. *Amer. J. of Psychol.*, 1911, 22, 553-577.
21. JACOBSON, E. Experiments on the Inhibition of Sensations. *Psychol. Rev.*, 1911, 18, 24-53.
22. JESINGHAUS, C. Zur psychologischen Theorie des Gedächtnisses. *Psychol. Stud.*, 1911, 7, 336-375.
23. JOTEYKO, J. Comment on retient les chiffres, les syllabes, les mots, les images. *Rev. psychol.*, 1911, 4, 3-20.
24. KAKISE, H. A Preliminary Experimental Study of the Conscious Concomitants of Understanding. *Amer. J. of Psychol.*, 1911, 22, 14-64.
25. KATZAROFF, D. Contribution à l'étude de la reconnaissance. *Arch. de Psychol.*, 1911, 11, 2-78.
26. KENT, G. H. Experiments on Habit Formation in Dementia Præcox. *Psychol. Rev.*, 1911, 18, 375-410.
27. KOFFKA, K. Ueber latente Einstellung. *Ber. IV. Kongress f. exper. Psychol.*, 1911, 239-241.
28. LANGFELD, H. S. Suppression with Negative Instruction. *Psychol. Rev.*, 1911, 18, 411-424.
29. LEVY-SUHL, M. Studien über die experimentelle Beeinflussung des Vorstellungsverlaufes. *Zsch. f. Psychol.*, 1911, 59, 1-90. (See also Vols. 42 and 45.) Collected and republished as a monograph. Leipzig: Barth, 1911. Pp. vi+142.
30. LEY & MENZERATH. *L'étude expérimentale de l'association des idées dans les maladies mentales*. Gand: Van der Haeghen, 1911. Pp. 199.
31. LIPMANN, O. Visuelle Auffassungstypen. *Ber. IV. Kongress f. exper. Psychol.*, 1911, 198-201.
32. LOBSIEN, M. Zur Entwicklung des akustischen Wortgedächtnisses der Schüler. *Zsch. f. päd. Psychol.*, 1911, 12, 238-245.
33. LOEB, S. Ein Beitrag zur Lehre vom Farbengedächtnis. *Zsch. f. Sinnesphysiol.*, 1911, 46, 83-128.
34. MARTIN, L. J. Zur Lehre von den Bewegungsvorstellungen. *Ber. IV. Kongress f. exper. Psychol.*, 1911, 196-198.

35. MEUMANN, E. Ueber den kombinatorischen Faktor der Vorstellungs-typen. *Zsch. f. päd. Psychol.*, 1911, 12, 115-120.
36. MEUMANN, E. Ueber Bekanntheits- und Unbekanntheitsqualität. *Arch. f. d. ges. Psychol.*, 1911, 20, 36-44.
37. MOEDE, W. Gedächtnis in Psychologie, Physiologie und Biologie. Kritische Beiträge zum Gedächtnisproblem. *Arch. f. d. ges. Psychol.*, 1911, 22, 312-389.
38. MÜLLER, G. E. Zur Analyse der Gedächtnistätigkeit und des Vorstellungsverlaufes. (*Zsch. f. Psychol.*, Ergbd. 5, Teil 1.) Leipzig: Barth, 1911. Pp. xiv+403.
39. OFFNER, M. *Das Gedächtnis. Die Ergebnisse der experimentellen Psychologie und ihre Anwendung in Unterricht und Erziehung.* (2. Aufl.) Berlin: Reuther & Reichard, 1911. Pp. x+258.
40. ORDAHL, L. E. Consciousness in Relation to Learning. *Amer. J. of Psychol.*, 1911, 22, 158-213.
41. PETERS, W. Gefühl und Erinnerung. *Psychol. Arbeiten (Kraepelin)*, 1911, 6, 197-260.
42. PIÉRON, H. Les courbes d'évanouissement des traces mnémoniques. *C. r. acad. d. sci.*, 1911, 152, 1115-1118.
43. PIÉRON, H. L'étude biologique de la mémoire. *Bull. soc. franc. de phil.*, 1911, 11, 1-27.
44. PIÉRON, H. Sur la détermination de la période d'établissement dans les acquisitions mnémoniques. *C. r. acad. d. sci.*, 1911, 152, 1410-1413.
45. PYLE, W. H. Retention as Related to Repetition. *J. of Educ. Psychol.*, 1911, 2, 311-321.
46. PYLE, W. H., & SNYDER, J. C. The Most Economical Unit for Committing to Memory. *J. of Educ. Psychol.*, 1911, 2, 133-142.
47. RANSCHBURG, P. Die Ergebnisse der experimentellen Psychopathologie des Gedächtnisses. *Ber. IV. Kongress f. exper. Psychol.*, 1911, 95-180.
48. SCHAUB, A. DEV. On the Intensity of Images. *Amer. J. of Psychol.*, 1911, 22, 346-368.
49. SLEIGHT, W. G. Memory and Formal Training. *Brit. J. of Psychol.*, 1911, 4, 386-457.
50. STARCH, D. Transfer of Training in Arithmetical Operations. *J. of Educ. Psychol.*, 1911, 2, 306-310.
51. WELLS, F. L. Some Properties of Free Association Time. *Psychol. Rev.*, 1911, 18, 1-23.
52. WELLS, F. L. A Preliminary Note on the Categories of Association Reactions. *Psychol. Rev.*, 1911, 18, 229-233.
53. WELLS, F. L. Practice Effect in Free Association. *Amer. J. of Psychol.*, 1911, 22, 1-13.
54. WINCH, W. H. Further Work on Numerical Accuracy in School Children. Does Improvement in Numerical Accuracy Transfer? *J. of Educ. Psychol.*, 1911, 2, 262-271.
55. WOODWORTH, R. S., & WELLS, F. L. Association Tests. *Psychol. Monog.*, 1911, 13, No. 57. Pp. 85.

MEMORY, CONCEPT, JUDGMENT, LOGIC (THEORY)

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It will be recalled that Bergson distinguished clearly between memory as recollection, or memory proper, and memory as habit, which merges into perception. An attempt to view the world *sub specie memoriæ* without making this distinction clear is to be found in an article by Moede (11), who proposes memory as a comprehensive principle of unity, a cardinal concept of psychology extended to biology and thence to the inorganic sciences. The resulting mnemonic *Weltbild* includes the persistence of matter, which is the possibility of repeated sensation, the laws of nature as the recurring relationships between inorganic bodies possessing memory, and in the organic world the principle of heredity, the idioplasmic memory of the germ-cells, which is not only the foundation of recapitulation and regeneration but also of the functions of the special organs and even of conscious memory which is an offshoot of that idioplasmic memory. Spirit itself, according to one view cited, is the eternal memory of things. It is the summation of all the different stages of memory. I am failing to do justice to the heavy apparatus of learning which is deployed in behalf of this comprehensive view, and to important qualifications. The question persists, however, as to whether the psychical characteristic of memory is not poured out with the bath in the attempt to flood the universe with memory.

Jesinghaus (6) gives an historical and critical review of the following theories of memory: the theory of "*petites perceptions*," the "*Spur*" theory (both of which presuppose in the interest of causal continuity the existence of latent psychical elements between the original and the recalled experience), and the theory of "dispositions." The last, as originated by Leibnitz and further developed by Wundt in analogy with the formation of physiological habit, is espoused by the author. The theory of "perseveration" and of "perseveration tendencies" originated by G. E. Müller is criticized as superfluous and untenable.

The literature of the doctrine of imageless thought has been critically canvassed by Angell (2) and the different questions involved disentangled and analyzed. Due credit is given for the stimulus to a keener and more searching analysis of thought-processes than any previous generation has known which the influence of the advocates

of this doctrine has afforded, but the doctrine is found open to suspicion on the following points (quoting in part from the conclusion of the article): (1) The method of its experimental investigation is at least not wholly satisfactory in meeting the demands of ordinary experimental procedure. (2) Imageless thought seems with many observers to be at best but a sporadic and occasional phenomenon. (3) It seems almost impossible to describe it save in negative terms. (4) We are apparently asked to recognize two generically different kinds of thought-material to serve one general function. This is at variance with our conceptions of the parsimony of nature. (5) There are many well-recognized conscious states which may obviously be readily confused with imageless thought. The consciousness of attitude springing out of very primitive physiological attitudes is an important case in point. (6) The presence of interpretative factors in perception gives no real comfort to belief in imageless thinking.—Angell concludes that “the only demonstrably imageless thought is subconscious and so primarily a matter of cerebralistic physiology. Even this would be imaginal if it got above the limen.”

Ogden (12), summarizing forty-nine articles bearing more or less directly on the doctrine of imageless thought, reaches a conclusion more favorable to the doctrine than Angell, although the up-shot of the matter seems to turn on an act of faith rather than on fact. “Those of us who believe that meaning is a conscious factor, directly given in our experience, find it unequivocally described in our introspective data, despite all errors of *Kundgabe* which may creep in. Those, on the other hand, who believe that meaning is a logical concept, which can be psychologically observed only in terms of sensory ‘vehicles,’ obliterate the *Kundgabe* from their reports and direct attention on the sensations and images which may be present.” Ogden is unable to see that the experiments of the latter give much promise of the possibility of working out a psychology of thought in terms of sensory symbols.

Jacobson (5) replies vigorously to a criticism by Ogden and asserts that as the result of investigations described by him “we find that *wherever there is meaning there are also processes*, and we find that the correlated meanings and processes are *two renderings, from different points of view, of one and the same experience*.”

Keyser (8) describes an interesting illustration drawn from the study of higher mathematics which is intended to show the limitation of the imagination as compared with thought. It is demonstrated that symmetric interpretations of a mathematical expression

possible for thought are beyond a certain point impossible for imagination. Thought looks about in spaces of ever-increasing dimensionality like a binocular being with its two-fold vision unimpaired, whilst the eyes of imagination not only fail as n mounts higher and higher but fail in unequal measure. Keyser appears to be conceiving of the imagination in terms of visual imagery, or at least in terms of images corresponding to the sense-perception of tridimensional space, and of the rather obvious limitations of images of this sort in dealing with space involving more than three dimensions. He does not consider the problem as to whether thought operates with or without some form of imagery.

The controversy between Alexander (I) and Stout as to whether presentations are mental or non-mental appears to involve the common assumption that the distinction is a purely descriptive, not a functional, distinction. Alexander states the view that sensations and images are both non-mental, objective, and that only conation and feeling belong to the mental sphere. Stout replies that the criterion of the physical is that of occupying space and entering as a factor into a spatially conditioned system, and that the criterion of the non-physical is that of being bound up with our existence as conscious beings. Conceivably, either Alexander's or Stout's view may be agreed with as it is exhibited. But it is not made clear why either view was or may be *taken*.

Betz (3) attacks the traditional doctrine that the concept is formed through abstracting the common element from a number of more or less similar cases. Psychological analysis shows that a concept may arise from a single case, and that the collective ordering of various cases under one concept is a subsequent affair.

Lloyd (10) sets forth the following general principles of antithesis: (1) Mutual reproduction. Each term is relative to the other, not merely by contrast, but intrinsically. Each has in its heart the nature of the other. Each reproduces the other. (2) Duplicity of meaning. Each term has a local, narrow, one-sided meaning, and also a meaning big and deep enough to take up both sides into itself. (3) Identity of opposites. An identity which means a "becoming," in which opposites are not reconciled, but sharpened. (4) Serial mediation. A mediation between the terms which heightens the difference even more than a cataclysmic leap could possibly do, as to be always dying even while living is no ordinary death, and as to be always living even while dying is no ordinary life. (5) Difference at once in kind and in degree. Gradation and continuity are some-

times falsely taken as synonyms, as when it is said difference in degree but not in kind. Gradation must also mean real difference, the realest sort of difference. (6) Dimensional difference. The terms of any antithesis are qualitatively different, yet functionally related. So are the dimensions of space. (7) Parallelism in all difference. Not mere occasionalism but a process of qualitative change incident to serial mediation.

The underlying logic of antithesis is that of differences which are all the more different because they are the same, because they are serially mediated and functionally related in an on-going movement or process. In other words, the logic of antithesis is that of organic unity.

The "new law of thought" discussed by Jones (7) may be stated as a *law of identity in diversity* with reference to the fundamental judgment-form, *S is P*, identity of extension, or denotation (*Be-deutung*), in diversity of intention or signification (*Sinn*). There are no more ambiguous words in philosophy than identity and difference, none more elusive. The source of the ambiguity lies in two fundamental kinds of sameness: (1) extensional, or denotational, sameness, and (2) qualitative sameness. The second is frequently but not always a sign of the first. For example, if a stowaway is observed to have all of the published characteristics of an escaped criminal, the similarity is regarded as an indication of "identity." It may, however, turn out to be a case of "mistaken identity."

Klein (9) agrees with the statement of the law as identity in difference in its application to affirmative predication, but takes exception to Jones's application of it to negative predication, as "difference of Denotation (Otherness) in difference of Intension (Diversity)." Negative predication should be interpreted as asserting neither a *difference in difference* nor an *identity in difference*, but a *difference in identity*. Logicians have failed to do justice to the implication of identity between subject and predicate in negative predication, to the relevancy, amounting to a partial identity in intension.

Russell (14) presents in clear, brief, and comprehensive form some of the net results of his work in the logic of mathematics. He concludes: (1) Mathematical logic has resolved the problems of infinity and of continuity and has rendered possible a solid philosophy of space, time, and motion. (2) Pure mathematics may be defined as an ensemble of propositions which are expressed exclusively in terms of variables and logical constants, in other words, which are purely

formal propositions. (3) The possibility of a knowledge of mathematics refutes both empiricism and idealism, since it shows that human knowledge cannot be deduced entirely from types of sense experience, nor can *a priori* knowledge be explained in a subjective or psychological manner.

In a book which is conceived in the manner of the school of William James and which runs "thick," not to say turbid, with illustrations and metaphors drawn from a wide range, Boodin (4) discusses the relations of truth and reality as an introduction to the theory of knowledge. The book is itself a living illustration of the definition of thinking which it advances, "a matrix of relations, reading forward and backward and throbbing with will—not the pale ghost of the formal proposition or syllogism, which, however important for the effectiveness of thought's procedure, are only its artificial tools." The act of judgment which involves a specific problem and a specific context, and which is always purposive, is the core of all thinking. That part of the book which seems most relevant to the topic of this summary is that which discusses the presuppositions of thinking, for the ego in willing to think—"both because it is practically useful and because it provides ideal sport"—"also wills to accept the formal conditions without which thinking would become impossible" (p. 157). These presuppositions or laws implied in all thinking are: (1) the law of consistency; (2) the law of totality; (3) the law of duality, or the presupposition of the subject-object relation; and (4) the law of finitude.

In a discursive and suggestive study of the part played by analogy in artistic and scientific thinking Read (13) gives especial attention to the analogy of relations where there is no similarity between the respective terms involved. What are the psychological conditions of originality in thought and imagination? Genius consists in an unusual power of "thought by analogy." Sensitiveness to analogy that distinguishes genius is apparently supported by extraordinary power of registering experiences, perhaps without consciously attending to them, or but slightly noticing them. Fear of convention, of authority, discourages the play of analogy. There are ages in which every sort of censorship, conventional, traditional, authoritative is relaxed, so that every man breathes more freely, is more himself, and genius is relatively abundant.

REFERENCES

1. ALEXANDER, S. On Sensations and Images. *Proc. Aristot. Soc.*, 1910, 10, 1-35.
2. ANGELL, J. R. Imageless Thought. *PSYCHOL. REV.*, 1911, 18, 295-323.

3. BETZ, W. Vorstellung und Einstellung. II. Begriffe. *Arch. f. d. ges. Psychol.*, 1911, 20, 186-225.
4. BOODIN, J. E. *Truth and Reality: An Introduction to the Theory of Knowledge*. New York: Macmillan, 1911. Pp. x+334.
5. JACOBSON, E. On Meaning and Understanding. *Amer. J. of Psychol.*, 1911, 22, 553-577.
6. JESINGHAUS, C. Zur psychologischen Theorie des Gedächtnisses. *Psychol. Stud.*, 1911, 7, 336-375.
7. JONES, E. E. C. A New "Law of Thought" and its Implications. *Mind*, 1911, 20, 41-53.
8. KEYSER, C. J. The Asymmetry of the Imagination. *J. of Phil., Psychol., &c.*, 1911, 8, 309-316.
9. KLEIN, A. Negation considered as a Statement of Difference in Identity. *Mind*, 1911, 20, 521-529.
10. LLOYD, A. H. The Logic of Antithesis. *J. of Phil., Psychol., &c.*, 1911, 8, 281-288.
11. MOEDE, W. Gedächtnis in Psychologie, Physiologie, u. Biologie: Kritische Beiträge zum Gedächtnisproblem. *Arch. f. d. ges. Psychol.*, 1911, 22, 312-389.
12. OGDEN, R. M. Imageless Thought: Résumé and Critique. *PSYCHOL. BULL.*, 1911, 8, 183-197.
13. READ, C. The Function of Relations in Thought. *Brit. J. of Psychol.*, 1911, 4, 342-385.
14. RUSSELL, B. L'importance philosophique de la logistique. *Rev. de mét. et de mor.*, 1911, 19, 281-291.

GRAPHIC FUNCTIONS

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The year's work on graphic functions is dominated by the pedagogical interest.

Miss Thompson (8) presents an excellent résumé of the researches bearing on the history and pedagogy of writing, without attempting any original contribution to the subject. A chapter on the historical development of the alphabet is followed by a summary statement of the experiments that have been made on the psychology of writing. A neurological analysis of the writing act is first given and the views of Mosso, Flechsig, Exner, Collins, and Pierre Marie stated.

Among others, the following experimental studies are reviewed: those of Bryan and of Gilbert on rapidity of movement; of Woodworth on the accuracy and control of voluntary movement; of Downey on sensory control of writing; of Fullerton and Cattell and of Münsterberg on causes of inaccuracy in movement; of Johnson, of Swift, of Bryan and Harter, and of Book on practice and habit; of Judd and of McAllister on the movements used in writing; of Gesell on the elation of accuracy in writing to school intelligence and sex.

In a final chapter on the pedagogy of writing, Miss Thompson attempts a practical application of experimental results to the teaching of writing. Thorndike's scale of handwriting is described and portions of it reproduced.

Superintendent Wilson (11) of Connersville, Indiana, reports the application of the Thorndike scale to the evaluation of the quality of writing of an entire school system. A sudden advance in quality was found to occur at the sixth grade. A test of the relation between quality of writing and training for speed showed that speed may be secured without a sacrifice, to any degree, of quality of writing.

Ayres (1) presents a new scale for measuring the quality of handwriting of school children, a scale which differs from that of Thorndike in that the quality of each sample of writing was determined by its degree of legibility as shown by accurately timed readings made by ten investigators. Professor Thorndike's scale, based on "general merit," is held to permit less exact valuation.

Ayres' scale consists of eight samples of handwriting, which become progressively better by equal steps from left to right. Each of the eight divisions is represented by writing in three slants, vertical, medium, and extreme slant. A given sample may be measured by sliding it along the scale to a sample of the same quality and slant which bears a number representing the value of the writing.

As regards the relation between legibility and the general appearance of handwriting, it was found that legible writing is always of good appearance but that the converse is not necessarily true. The crowding together of words on the line or the too close spacing between lines are, often, causes of a low degree of legibility, facts of importance in connection with the choice of a system of penmanship.

Starch (7) proposes a method of measuring handwriting by means of a graphometer scale which measures the mean variation of the slant of letters and their mean variation from the base-line, a method held to be more accurate than the method of direct comparison with standard specimens.

Discussing some issues in the teaching of handwriting, Freeman (3) raises several questions. First, as to the preferability of vertical or slant writing. Since, as the writer shows, slant-writing is not irreconcilable with a hygienic position, this question must be decided on the score of ease and rapidity of movement and of legibility of writing. Theoretically, vertical writing is most legible, but only slightly more so than writing of a moderate slant. On the other hand, slant writing excels in ease and rapidity as shown by an analysis

of the movements concerned. Secondly, should the child be trained at one and the same time in form and in correct habits of movement? To attempt this may result in a scattering of attention. Moreover, since the development of motor skill comes at the age of eight or nine years, it is a mistake to give the child of six or seven a drill for which he has not yet developed sufficient motor control. The perception of form should be early developed while movement drill may be deferred until the child is in the third or fourth grade. Third, should finger movement or arm movement be taught together or separately? It is probably well to allow the child to follow at first his natural inclination to use the finger movement, deferring the use of the arm component in conjunction with the finger movement until the child has developed motor control. Fourth, should letters or words be used at the beginning of the writing drill? Neither should be used exclusively. Fifth, what form of movement is preferable? The arguments advanced for the use of arm and of finger movements are rehearsed, with the conclusion that the most favorable type of movement combines the use of the arm, of the wrist, and of the fingers.

Freeman (4) also discusses certain problems and methods of investigating handwriting. One of the most important problems is the effect upon quality of an emphasis upon the speed of writing or the effect upon speed of an emphasis upon quality. The writing lesson should be so conducted as to emphasize one or the other of the two characteristics. Again, how does writing develop at different ages? How do speed and form change from grade to grade? Are there times when there is a marked increase in the capacity for rapid writing? The relative advantages of arm movement and of the combined arm and finger movement might be determined by seeing that two groups of children were taught exactly alike except for this one feature. There must be uniformity in the method of measuring the speed and quality of writing. Speed may be measured by finding how long it takes the child to write a certain amount or by finding how much is written in a certain time. For the measurement of quality of writing Ayres's method of grading legibility is recommended.

An exposition of the Montessori method of teaching writing is given by Warren (10). The distinctive feature of the method is the emphasis given to touch and to the kinæsthetic sense.

An interesting résumé of the influences affecting handwriting and a statement of the problems that need investigation is contributed by Näcke (5). Sceptical of the determination in any detail of the character significance of handwriting, Näcke devotes himself chiefly

to the question of the identification of handwriting and the extent to which individual features persist in spite of changed conditions. Using as a text the attempt of Frau Thumm-Knitzel to settle the Shakespeare controversy by a detailed comparison of the authenticated signature of Shakespeare with the writing of other important documents, the author urges that in attempting any identification by such means much writing material of different periods and of differing content must be utilized, for individual variation may be very great, especially in the case of highly gifted individuals. The influence of age on writing must be noted. On account of eye changes, in old age script often becomes smaller and poorer. Cases of clear firm writing in old age deserve special consideration. The kind of pen and paper used; the condition of the writer, whether warm or cold, fatigued or fresh; the speed with which he writes; the formal or informal contents of a given document are important factors. Above all, the influence of race upon handwriting deserves consideration. The author recognizes the persistence of writing individuality through many changes of conditions, so that left hand writing resembles right hand writing and the mirror scripts of both hands resemble each other and the normal script. Even in pathological cases similarity to the normal hand may persist for a long time and such similarity may be found in mediumistic writing even when there is intentional or unconscious imitation of the writing of another.

Näcke raises the problem of handwriting and of inner speech in dreams, urging the need of further investigation. There are, it appears, a motor and a visual type of writing dream. In the first instance, the dreamer himself writes the thoughts which he reads; in the second case, he reads the printing or writing which he sees before him.

As a transition from a reflex activity to a conscious one, the drawings of infants merit the attention of psychologists. Bechterew (2), writing from this point of view, protests against the attempt to interpret the acts of children as significant of the thoughts and feelings of adults. He insists upon a wholly objective interpretation of childish drawings which inform us of a mode of reaction which constitutes a part of their psychic reaction and ought to be judged only in relation with the factors which have determined them, such as hereditary influences, motor coördination of the fingers, and the like.

Bechterew's report concerns in particular the development of the drawing capacity in two children, with supplementary observation on a number of other children. Among other things the study con-

cerned itself with the following points: the greater or less regularity of the lines evidencing the motor coördination of the fingers; the greater or less complexity of the drawing; the greater or less agreement of the drawing with the material object; the manifestation of creative activity in the representation of the different parts; the elaboration of the subject; the exactitude or the inexactitude of the perspective; the peculiarities of the drawing relevant to the special conditions of education and environment. The development traced showed a general parallelism with the evolution of drawing among primitive peoples.

Van Gennep (9) reports a number of tests on the drawing capacity of a little girl of five years. Although copies were set for the child, she manifested a strong inclination to throw her attention upon the object represented. The experiment showed that the execution of geometric outlines or of alphabetical signs was extraordinarily difficult for the child; the realistic representation of such objects as a chair or a lamp very easy. This result is of significance in the interpretation of prehistoric drawings and the drawings of semi-civilized peoples and in line with the conclusion of those investigators of primitive art who have shown that, in origin, art is realistic and that geometric and conventional drawing is a later development.

As abstract ideas are posterior to concrete ideas, so ornamental designs are the product of abstraction. The alphabetical sign is the last term in a long course of development. To teach first the drawing of isolated letters is, according to Van Gennep, to invert the natural order of development which begins with the representation of natural objects.

Sargent (6) presents a valuable discussion of five problems in the experimental pedagogy of drawing. First, how far does special talent in drawing consist primarily in an unusual interest in the pictorial aspect of objects and to what degree may a lack of such interest be compensated for by an emphasis upon aspects of objects related to other interests of children? Second, what value pertains to the following methods in teaching the representation of objects involving common geometric shapes—drawing directly from objects; theoretical study of perspective; developing concepts of solidity? Third, is there any psychological reason for the reduced size of drawings made naturally by a child and does this size bear any ascertainable relation to the size of the retinal image? Fourth, what habits of expression are developed by rapid sketching? By carefully finished drawings? Fifth, to what degree does each of the following methods

promote the child's drawing ability: detailed observation of objects and comparison of the drawings with the object; study of pictures, including copying or tracing; modeling in plastic material; seeing a skilful draughtsman draw the object under consideration; memory-drawing?

REFERENCES

1. AYRES, L. P. A Scale for Measuring the Quality of Handwriting of School Children. *No. 113. Dep't of Child Hygiene, Russell Sage Foundation.*
2. BECHTEREW, W. Recherches objectives sur l'évolution du dessin chez l'enfant. *J. de psychol. norm. et path.*, 1911, 8, 385-405.
3. FREEMAN, F. N. Some Issues in the Teaching of Handwriting. *Elementary School Teacher*, 1911, 12, 1-7; 53-59.
4. FREEMAN, F. N. Problems and Methods of Investigation in Handwriting. *J. of Educ. Psychol.*, 1912, 3, 181-190.
5. NÄCKE, P. Biologisches und Forensisches zur Handschrift. *Neur. Centbl.*, 1911, 30, 642-654.
6. SARGENT, W. Problems in the Experimental Pedagogy of Drawing. *J. of Educ. Psychol.*, 1912, 3, 264-276.
7. STARCH, D. An Objective Measurement of Handwriting. *PSYCHOLOGICAL BULLETIN*, 1912, 9, 83-84.
8. THOMPSON, M. E. *Psychology and Pedagogy of Writing. A Résumé of the Researches and Experiments Bearing the on History and Pedagogy of Writing.* Baltimore: Warwick & York, 1911. Pp. 128.
9. VAN GENNEP, A. Dessins d'enfant et dessin préhistorique. *Arch. de psychol.*, 1911, 10, 327-337.
10. WARREN, H. C. "The House of Childhood." *J. of Educ. Psychol.*, 1912, 3, 121-132.
11. WILSON, C. M. The Handwriting of School Children. *Elementary School Teacher*, 1911, 11, 540-543.

VOCAL FUNCTIONS

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"To the enthusiasm of the eighties and nineties has succeeded a stagnation, a retrogression, even, in experimental phonetics," says Poirot (15), in the preface to his volume on Phonetics, in Tigerstedt's monumental *Handbuch der physiologischen Methodik*. Some of the foremost champions of the science have passed away; others have devoted themselves to other studies. And the younger generation has not grown up to their measure. The present situation will not be essentially bettered until the philologically trained phoneticians have made friends with the experimental methods and shared in the

labors of the experimental school. What is most needed today is a series of minute investigations of detailed problems, to evaluate and control the earlier results achieved by the method of observation. It is not sufficient that the philologist seek the collaboration of a scientist: the philological and the experimental schools must be united. Whoever utilizes experiment must master the experimental methods.

Poirot's manual aims to make this thorough mastery of the experimental methods easier. It differs from the two existing manuals of L'Abbé Rousselot and Scripture in the great pains that have been exercised to make the text clear and simple as well as comprehensive; and in the emphasis upon methods rather than upon results. Only such accounts of achieved results have been admitted as serve to illuminate the discussion of methods, and the selected bibliography of 211 titles contains only references to works significant for the understanding of the methods of experimental phonetics. Three generous chapters are devoted chiefly to the technique of graphic registration of speech movement, and the study of those dynamic and acoustical properties of the air which are significant for phonetics. A fourth chapter of seventy-five pages, on measurements and computations, seeks to smooth the way of the higher mathematics to the neophyte who must thread the maze of Fourier's Theorem. The volume as a whole is distinctly a workable manual.

The problem of the nature and production of vowel sounds we still have with us. Hermann (7) comes to the defense of the Helmholtz doctrine of formants (the doctrine that for each vowel a certain absolute pitch is characteristic) provoked by the assertion of L. Fredericq that the altering of the rate of revolution of a phonograph cylinder does not alter the character of the vowel sounds.¹ Hermann, following several earlier investigators, had twenty years ago obtained unambiguous results of the opposite kind: alteration of rate was found to produce a distortion of the vowel qualities, even to the point of unrecognizability. He has now repeated his experiments with perfected apparatus, elaborate precautions and controls, confirming his early researches and adding new observations. Among these may be noted the generalization that *retarding* the rate of the cylinder distorts the vowel character much more than a corresponding acceleration. An exception is found in the case of high soprano notes. The results as a whole lend confirmation to the view that certain vowel qualities are determined by the presence of both primary and secondary formants, the latter lower in pitch as well as fainter than the ones most easily detected. It is further suggested that

¹ Bericht der VIII. Internationalen Physiologen Kongresses, Wien, 1910.

the pitch of a formant is variable within moderate limits; and that ordinary vocalization pitches these formants near their lower limits: hence the greater distorting effect of retarding a phonographic cylinder, as compared with accelerating its rate.

In a more recently published and more elaborate study of the production of vowels, Hermann (8) amplifies these and his earlier researches, and develops the formant theory still farther. He marshalls objections against the theory that the resonance cavity in producing the vowel character acts merely by strengthening overtones which are already present in the vocal clang, and undertakes instead to account for the generation of formants by the direct action of the air stream on the resonating cavity, which thus serves as an independent source of sound. This, of course, is no unique doctrine as applied to whispered vowels. Its distinctive feature is found in the theory of the manner in which the formants of vocalized sounds are generated. It is Hermann's view that each sound-wave of the vibrating air sent out from the larynx serves as a separate blast to actuate the resonating cavity. Studies of the acoustics of reed-pipes and new experiments in artificial vowel synthesis based upon the results here obtained have convinced Hermann that such a view is not merely tenable but necessary. Further confirmation is found in an analysis of speech-sound photographic records made with a stentor-microphone and a capillary electrometer, a method which has distinct advantages over the more usual one of enlarging phonographic tracings. Analysis of these vocal records also serves to substantiate the author's position that in addition to the pitch of the formants there are other distinguishing characteristics of certain vowels, and perhaps of all vowels.

Gutzmann (5) brings additional confirmation of Hermann's doctrine regarding the generation of formants, as a result of his analysis of vowels artificially made by combinations of reeds and resonating chambers.

Weiss (22) has used a soap-film phonoscope to record whispered and lightly sung vowels, for contrast with the curves of louder tones. He recognizes that the chief technical difficulty in all such investigations as these is the elimination of damping and sympathetic vibration of the diaphragm. Without achieving complete success in meeting this problem he nevertheless secures some extremely interesting curves which show that, in the records of the vowels U, O and A at least (continental sounds), the formant vibrations are of uniform amplitude in the whispered and lightly sung vowels, while with louder singing they wax and wane in amplitude with each pulse

of the primary tone vibration. No attempt is made to point out the bearing which these facts may have on the doctrine of Hermann, mentioned previously. Weiss has succeeded in getting records of sibilants in which the vibration frequency of *Sch* was found to range between 3,000 and 4,500. With *Ss*, the frequency rose to 6,000 and more a second.

Glover (4), studying the production of vowel sounds, has made observations of the vocal breath vapors simultaneously emitted from the nasal and buccal cavities. Normally the vowels give a buccal vapor but no nasal vapor: throughout the whole extent of pitch and in each variety of voice the posterior nasal orifice is closed. The presence of the consonants M and N either initial or final (French) produces a nasal vapor; but this diminishes in passing from grave to acute. It is impossible for a soprano to articulate *an*, *on*, etc., on a high note. The soft palate particularly, but also the other organs of articulation, undergo an evident influence from the variations of laryngeal tonicity. There is an organic and functional harmony between the activity of these organs. Hence the need in vocal training of emphasis on precision in articulation, since the process of articulation exerts an influence on the laryngeal note and the two are co-ordinated. This leads to a new conception of vocal registers: they are infinite in number. They shift and vary with all the attitudes of the soft palate and the other organs of word formation. These multitudinous registers may be classified into grave and acute, with a region of especial difficulty in the activity of the organs of verbal formation around *re*³ (293 v.d.), *me*³, *fa*³ (*d'*, *e'* and *f'* in our notation). Voices should be classified according to (1) the range of laryngeal tonicity and (2) possible range of articulation. Glover's views are supported by observations with a thoracic radioscope and with a new multiple-image laryngoscope permitting lateral examination of the vocal cords, as well as by the breath-vapor method mentioned above.

Marage (10) photographed voice vibrations on a film moving slowly so that the vibrations were not dissociated, but the general form of the consonants was made obvious. He thus obtained evidence confirmatory of one of the common classifications of consonants into (1) nasals, requiring both nose and mouth; and (2) mouth consonants, of which there are three sorts: (*a*) continuous consonants: the amplitude of the tracing gradually increases from zero (F, S, J); (*b*) explosives: the amplitude is maximal at the onset, and diminishes (B, D, G, P, T, K); and (*c*) vibrant consonants (L, R). Further observations on the relation and relative duration of consonants and

vowels lead to two applications: In first teaching children to read, vowels and consonants should be joined and not separated, as in the "Janicot" method. In ridding vocal pupils of an objectionable stroke of the glottis, exercises may well begin with substituting an explosive consonant, as B, for the stroke of the glottis, before the practice-vowel.

Several investigators are turning their labors toward the problems of speech melodies. The practicability of the Marbe smoke-flame method for the study of these delicate variations in pitch is made evident in the contribution of Panconcelli-Calzia (13) whose study of melodies in spoken Italian sentences and Italian poetry is a most promising beginning of a series of researches in the difficult field of speech melodies. Pollak (16), for similar purposes, uses phonographic records mechanically transferred to smoked paper. His study of the final cadence in the German declarative sentence is the first of several researches he is now carrying forward in the Vienna phonographic archives. Stefanini (18) has recourse to microscopic examination of phonographic cylinders, but his interest is not primarily in pitch.

Gutzmann (6) has carried the phonographic method into the realm of child study. He caught the first cry of his new-born daughter, and throughout the first year observed and recorded with the skill of the practical phonetician the development of vocal and articulatory reflexes. His report has a value to students of instincts because of the definiteness and minuteness of its records; and students of musical science will welcome the careful observations on pitch production during the pre-imitative stage of development and the early stages of vocal control.

Urbantschitsch (21) has turned his attention to the problem of the influence of sound sensations on speech. He brings together the findings of many investigators who have studied the motor effects of sounds upon the ear muscle, the tensor tympani, the eyes, the face, the musculature of bodily equilibrium and so on. As he points out, both anatomical and pathological evidence demonstrates that the nervous paths of these sound reflexes generally do not involve the cortical auditory centers, but are more direct. The stimuli of some of these reflexes are intense sounds. Other responses are called forth by faint, even subliminal, stimuli; and in some instances the specific stimulus is a sound of a certain pitch. Urbantschitsch then raises the question whether speech can be reflexly influenced through sound sensations. He cites the literature regarding the reflex effects of sounds on breathing but seems to have completely overlooked the work of Cameron, Seashore, and others on the influence of sounds on

maintenance of pitch in singing. The results of Sokolowsky (17), who found a much greater inaccuracy in singing with auditory distraction than in imitating a tone, may also be cited here.

Urbantschitsch's method was to ask his subject to read aloud without letting himself be distracted by tones and noises conducted now to the right ear and now to the left. The effects were varied, but some disturbance amounting frequently to a stammering, a slowing of the rate of utterance or even a complete stoppage of enunciation was produced by some of the auditory stimuli. Ordinarily the interference increased with the continuance of the stimulus.

J. Meyer's contribution (12) describes and classifies the various voluntary and reflex movements of the ear muscles and describes a peculiar case of pathological connection between utterance and ear-movement.

Dupré and Nathan's *Le langage musical* (1) is the work of two gifted physicians who have concentrated their attention upon the study of aphasias, amnesias and allied mental disorders, with especial reference to abnormalities of the musical consciousness. Language is broadly defined as a means of communicating psychic content. Its reflex origin is set forth, after which follows a description and a theory of normal vocal control through auditory and kinesthetic sensations, as a preface to the main purpose of the volume which is the description of musical abnormalities. Few pages are given to vocal functions as such; many more to the mental processes accompanying and controlling them. Relatively little new material is brought forward by the authors. They have been content with a fluent, simple presentation of conventional psychological doctrine and a general survey of their field with special reference to the facts of musical pathology.

The thesis of Super (19) is that rational thinking may be independent of speech. In support of this position he draws from varied sources, especially from his knowledge of deaf children, their conversation, their actions and the peculiarities of their ways of learning language. Fay's paper (2) is a controversial discussion of an earlier article by Professor Alexander Hill. It is really a defense of the classics, and of their study because they are difficult and because language is a stimulator of thought. Incidentally the reader finds several good observations and comments on naturalness of word orders in different languages.

REFERENCES

1. DUPRÉ, E. and NATHAN, M. *Le langage musical. Etude médico-psychologique.* Paris: Alcan, 1911. Pp. viii+197.
2. FAY, E. W. Language Study and Language Psychology. *Pop. Sci. Mo.*, 1911, **79**, 369-384.
3. GIESSWEIN, M. Ueber die "Resonanz" der Mundhöhle und der Nasenräume, im besonderen der Nebenhöhlen der Nase. *Beitr. z. Anat. etc. d. Ohres, etc.*, 1911, **4**, 305-353.
4. GLOVER, J. Registre et classement des voix d'après l'observation des buées vocales de la bouche et du nez, etc. *C. r. acad. d. sci.*, 1911, **152**, 897-899.
5. GUTZMANN, H. Die Analyse künstlicher Vokale. *Med.-Päd. Monat. f. d. ges. Sprachhk.*, 1911, **21**, 177-185.
6. GUTZMANN, H. Beobachtungen der ersten sprachlichen und stimmlichen Entwicklung eines Kindes. *Med.-Päd. Monat. f. d. ges. Sprachhk.*, 1911, **21**, 27-32; 88-96; 97-111.
7. HERMANN, L. Der Einfluss der Drehgeschwindigkeit auf die Vokale bei der Reproduktion derselben am Edison'schen Phonographen. *Arch. f. d. ges. Physiol. (Pflüger)*, 1911, **139**, 1-9.
8. HERMANN, L. Neue Beiträge zur Lehre von den Vokalen und ihrer Entstehung. *Arch. f. d. ges. Physiol. (Pflüger)*, 1911, **141**, 1-62.
9. KATZENSTEIN, J. Ueber Brust-, Mittel- und Falsettstimme. *Beitr. z. Anat. etc. d. Ohres, etc.*, 1911, **4**, 271-301.
10. MARAGE, M. Contribution à l'étude des consonnes. *C. r. acad. d. sci.*, 1911, **152**, 1265-1267.
11. MEYER, E. A. Ein neues Verfahren zur graphischen Bestimmung des musikalischen Akzents. *Med.-Päd. Monat. f. d. ges. Sprachhk.*, 1911, **21**, 227-243.
12. MEYER, J. Ueber Ohrmuschelbewegungen beim Sprechen. *Med.-Päd. Monat. f. d. ges. Sprachhk.*, 1911, **21**, 129-134.
13. PANCONCELLI-CALZIA, G. Die Sprachmelodie in italienischen Sätzen und in einem italienischen Gedicht. *Med.-Päd. Monat. f. d. ges. Sprachhk.*, 1911, **21**, 161-176.
14. PIELKE, W. Ueber "offen" und "gedeckt" gesungene Vokale. *Beitr. z. Anat. etc. d. Ohres, etc.*, 1911, **5**, 215-231.
15. POIROT, J. *Die Phonetik.* Leipzig: Hirzel, 1911. Pp. 276. (Dritter Band, 6 Abteilung, Tigerstedt, Handbuch der physiologischen Methodik.)
16. POLLAK, HANS W. *Phonetische Untersuchungen. I. Zur Schlusskadenz im deutschen Aussagesatz.* Wien, 1911.
17. SOKOLOWSKY, R. Ueber die Genauigkeit des Nachsingens von Tönen bei Berufssängern. *Beitr. z. Anat. etc. d. Ohres, etc.*, 1911, **5**, 204-214.
18. STEFANINI, A. L'analisi delle vocali. *Arch. ital. d'otol., rin., e lar.*, 1911, 459-473. (Also translated into French, *Arch. de laryng., ot., rhin.*, 1911, **32**, 835-844.)
19. SUPER, C. W. Language and Logic. *Pop. Sci. Mo.*, 1911, **78**, 491-499.
20. TALAYRACH, I. La philosophie du langage de Julius Bahnsen d'après des documents inédits. *Rev. de mét. et de mor.*, 1911, **19**, 780-802.
21. URBANTSCHITSCH, V. Ueber den Einfluss von Schallempfindungen auf die Sprache. *Arch. f. d. ges. Physiol. (Pflüger)*, 1911, **137**, 422-435.
22. WEISS, O. Die Kurven der geflüsterten und leise gesungenen Vokale und der Konsonanten Sch und Ss. *Arch. f. d. ges. Physiol. (Pflüger)*, 1911, **142**, 567-577.
23. WETHLO, F. Einfache Vorrichtung zur Demonstration der Stimmensätze. *Med.-Päd. Monat. f. d. ges. Sprachhk.*, 1911, **21**, 270-272.

SPECIAL REVIEWS

LAUGHTER

Laughter: an Essay on the Meaning of the Comic. HENRI BERGSON.

Authorized translation by C. BRERETON and F. ROTHWELL.
New York: The Macmillan Company, 1911. Pp. 200.

This excellent translation of one of the earlier and more popular of Bergson's writings will doubtless appeal to a wide circle of readers. Unless we are mistaken, however, the arguments, when examined, will be found to be more ingenious than convincing. The main title of the work, indeed, is obviously too broad: laughter is excited not only by the ludicrous, but also by various causes of joy, and even physically, as, *e. g.*, by tickling, by certain kinds of acute pain, and, again, on occasion, by hysterical grief. Nor is it always excited by perception of the comic. It belongs, no doubt, to the general type of reflex acts, but, like others of its class, it is more or less subject to control. The connoisseur of the comic is apt to enjoy the finest flavor of his amusement with a suppressed smile, while the professional funny man, who lacks in no respect appreciation of his own jokes, adds to the merriment by masking his countenance with the blandness of the rustic or the solemnity of the judge. Bergson's essay, then, is not an essay on laughter generally, but on the comic and the laughter excited by it. Its real title is the sub-title.

What, then, makes a thing or a person comic? Why do we laugh? The comic, according to Bergson, has three noteworthy characteristics,—it is exclusively human, for although animals may appear comical, it is only by suggesting the human; it is un-emotional, appealing purely and simply to the intelligence; and it is social, the intelligence perceiving it remains in touch with other intelligences and the laughter it provokes has real or imaginary connection with that of others by a sort of social freemasonry. With these characteristics in mind we are ready for the theory. The particular point, it declares, on which the attention of the group is concentrated when it finds anything ludicrous is a certain lack of elasticity, something rigid or mechanical, an automatism or absentmindedness where life and society require plasticity and adaptation. The centrally comic subject—though it is the last to be treated in the book—is the comic

character. Three things are essential to form a comic character,—unsociability in the performer, insensibility in the spectator and automatism, absentmindedness. The type is Don Quixote, with his systematic absentmindedness, “the most comical thing imaginable.” The combination of elements found in this case sheds its light over the entire field. The comic spirit cannot, indeed, be imprisoned in a definition. The formula, “something mechanical encrusted on the living,” which expresses its essence, is modified as it expands. We substitute the vaguer image of some rigidity or other applied to the mobility of life, or attention is called to the physical in a person where the moral side is in question, or we find the manner seeking to outdo the matter, or the person gives the impression of being a thing, etc. But everywhere the principle is the same, everywhere there is an element of stiffness, absentmindedness, viewed unemotionally by the social group or its representative. And the laughter? The laughter is the social corrective of the mechanism, rigidity, absentmindedness. Such is Bergson’s theory.

It is not difficult to find illustrations for the theory; this book is full of them. It is curious, indeed, when once our attention is called to the fact, to observe how many funny things appear to contain the ingredients indicated. We had not thought that it was the unemotional perception of something rigid in the living that caused us to laugh, but Bergson makes us see that, whether or not such is of the essence of the comic and whether it be true or not that our laughter is the means appropriated by society for its correction, the rigidity, at least in many cases, is there, or the comic fact can be interpreted plausibly as though it were. Evidence and explanation are, nevertheless, not quite convincing. We remember that the comic on any theory involves some kind of incongruity and, since it is met with preëminently, if not exclusively, in things human, we are not surprised to find numerous cases in which the special incongruity appears as a sort of rigidity or automatism in contravention of the plastic demands of life. But is this always the case? Well, there is at least one class of cases in which the interpretation seems forced, namely the witticism, or joke. Bergson devotes part of a chapter to the comic in words. The witty or comical saying—there is no essential difference—has the power, he says, of rapidly sketching and evoking the image, dim or distinct, of a comic scene. The scene evoked is comic on its own account and conforms to the general principles enunciated for the comic in situations or actions. But the word or saying evoking it is also held to be comic. How is this

explained? As the projection on the plane of words of the comic in actions and situations. The rigidity, mechanism or absentmindedness which is found in them is now found as infecting language itself. An illustration will make this clearer. "He is always running after a joke," remarked some one of a conceited fellow; and the hearer retorted, "I'll back the joke!" (p. 116). Now we are left to discover for ourselves the element of mechanism in the animated picture of the pursuit, and doubtless each one will find it where it pleases him. But the comicality of the witticism is explained by Bergson as due to the fixing of attention on the material aspect of a metaphor, to the fact that an expression used figuratively is taken literally. And this, no doubt, is partly true. But how is this connected with the principle of mechanism? It is connected by the application to language of the law, primarily applied to persons, that we laugh if attention is diverted to the physical when the moral is in question. Here, then, language itself is regarded as having a kind of moral personality in its figurative use and a physical in its literal; the comic saying is viewed as a lapse of attention, not to—for the wit may surely be presumed to be alive to the meanings of words—but in language. It may be left to the reader to judge the warrant and fitness of the analogy. To the reviewer the principle appears self-attenuated in a metaphor.

But there are other objections. Life, we recall, is not pure plasticity; the living organism has its own elements of rigidity. Social life in particular has its own habits, its conventions, and the mechanization of the individual's life to conform to them is not regarded as comical, a thing to be laughed at and corrected, but rather as something required and approved. The comical person is one who, to be sure under definite restrictions, flouts conventions, the "original," the eccentric, often, it must be acknowledged, appearing to exhibit less rigidity than an effusive spontaneity and abounding energy. The reply, of course, will be that, whatever the liveliness of his mind or movements, his very eccentricity shows lack of plastic accommodation to social requirements and that his oddities carry him on by a kind of physical momentum. Be it so; we can no doubt always discover what we look for. But there is one thing at least which the theory fails to explain. Why is it, namely, that when attention is called to the rigidity encrusted on life, the mechanical in the living, the absentminded, or whatever the phrase may be, we do not necessarily find it comical? The man who is always expressing himself in the same set phrases, the speaker always using the same wooden

gestures,—these are comical figures, according to Bergson, but to us on occasion, and presumably to him also, such exhibitions and a thousand others of different types at which we at times laugh heartily, appear simply dull, stupid, irritating, disgusting, or it may be, pitiable, or pathetic. Even the systematic absentmindedness of Don Quixote, that “most comical thing imaginable,” has been known, as the writer can testify, to exert a most depressing influence. There are times when nothing whatever seems funny to us, and then anon we are ready to laugh at almost anything. Why is this? The facts clearly point to the coalescence of something subjective with the objective in the constitution of the comic. What may this be? The only subjective factor which Bergson explicitly recognizes in the major part of his exposition is “insensibility,” “absence of feeling.” The comic, he says, makes its appeal to pure intelligence; laughter has no greater foe than emotion. Now it is true, of course, that comic laughter is incompatible with serious emotion, but if there is anything certain in the æsthetics of this subject it is surely this, that the comic never appeals solely to the intelligence. On the contrary, to be appreciated, it must either find us in, or surprise us into, the mood of its own humor. And that humor would seem to be, whatever its other characteristics, one of relaxation, or play. Bergson himself, near the close of his discussion, offers us the suggestion of this solution of our question. Speaking of the comic character he says (pp. 194 ff.), he is one “with whom, to begin with, our mind, or rather our body, sympathizes”; “we treat him first as a playmate”; “there is in laughter a moment of *relaxation*”; “comic absurdity gives us from the outset the impression of playing with ideas” and “our first impulse is to join in the game.” And the same, he adds, might be said of the other forms of the laughable. Disregarding the expression, “or rather our body,” inserted, apparently, to save the face of the theory which had originally excluded “feeling,” and therefore sympathy, we seem here to be on the right track. We begin to see that we discover the comic not, as some theories (but not Bergson’s) have held, in mere perception of incongruity, or in the shock of surprise, or in the glory of superiority, or in the sudden thwarting of expectation—though these may be among its conditions or accompaniments—but only by a kind of inner imitation in which, momentarily at least, the serious tension of life is relaxed and we become like children at play. Bergson, however, while suggesting this explanation, refuses to regard it as either central or final. Nor does he follow it up with an analysis of the conditions and interre-

lations of the tension and its brusque termination which we find in laughter. All that he says on this subject is that there is always a tendency, deep-rooted in the comic, to take the line of least resistance, generally that of habit (p. 196). And this he judges to be a kind of social infection. He recurs, accordingly, to the view that laughter is before all things a social corrective whereby society avenges itself for the liberties taken with it and seeks to counteract the "poison"; the last word is that, like the foam of the sea, it is sparkling froth with a saline base and its after-taste bitter. This view seems to be too seriously pedantic for universal application. Laughter does not at least seem to be always of the nature of a social "ragging." We not only laugh at, but with, our fellows. Bergson allows that in enjoying a joke it is in most cases difficult to say whom we are laughing at; would it not be truer to say that it is impossible? And if comic laughter has a social function, as it doubtless has, and its spirit is akin to that of play, is it not at least as plausible to find that function in the serviceable relaxation it affords to the strain and stress of life as in the chastisement it inflicts on lapses from its "requirements"?

H. N. GARDINER

SMITH COLLEGE

BOOKS RECEIVED DURING JULY AND AUGUST

MOSIMAN, E. *Das Zungenreden, geschichtlich und psychologisch untersucht.* Tübingen: Mohr, 1911. Pp. xv + 137. M. 4.50.

ROBINSON, V. *An Essay on Hasheesh.* New York: Medical Review of Reviews, 1912. Pp. 83.

DEUSSEN, P. *The System of the Vedānta.* (Authorized translation by C. Johnston.) Chicago: The Open Court Publishing Co., 1912. Pp. xiii + 513.

LOEB, J. *The Mechanistic Conception of Life.* Chicago: The University of Chicago Press, 1912. Pp. 232. \$1.50 net.

BINET, A. and SIMON, TH. *A Method of Measuring the Development of the Intelligence of Young Children.* (Authorized translation with preface by Clara H. Town.) Lincoln, Ill.: The Courier Co., 1912. Pp. 83. \$1.00.

MOLL, A. *The Sexual Life of the Child.* (Trans. fr. German by Paul, E.; Intro. by Thorndike, E. L.) New York: Macmillan, 1912. Pp. xv + 338. \$1.75 net.

TRÖMNER, E. *Das Problem des Schlafs. Biologisch und psychophysiologisch betrachtet.* Wiesbaden: Bergmann, 1912. Pp. 88.

NOTES AND NEWS

THE first number of a new German periodical, *Fortschritte der Psychologie und ihrer Anwendungen*, has just recently come to hand. It is edited by Dr. Karl Marbe, of Würzburg, with the assistance of Dr. Wilhelm Peters, and it professes to devote itself equally to the science and to its practical applications. To quote from the introductory announcement: So wenden sich die "Fortschritte" nicht nur an Fachpsychologen, sondern auch an alle diejenigen Praktiker und Gelehrten, die sich von seiten der Psychologie eine Förderung ihrer Disziplinen versprechen müssen. Bei der besonderen Bedeutung der Psychologie für die Philosophie darf die Zeitschrift wohl auch auf eine freundliche Aufnahme in den Kreisen der Philosophen rechnen.

PROFESSOR IRVING KING'S *The Psychology of Child Development* has recently appeared in a Bohemian translation.

DOCTOR EDWIN D. STARBUCK, Professor of Philosophy in the State University of Iowa, has been granted sabbatical leave for the coming year, and will reside in Boston. He will act for the year as psychologist adviser to *The Beacon Press* in the publication of children's and young people's literature, and especially in the formation of the graded Sunday School curriculum.

H. PIÉRON has succeeded Binet as Director of the laboratory at the Sorbonne. The *Année psychologique* will be continued under his editorship. It will be issued this year by Simon and Larguier des Bancelles.

THE August number of the BULLETIN, dealing especially with comparative psychology, was prepared under the editorial care of Professor Margaret Floy Washburn.

THE following items are taken from the press:

DR. JOSEPH JASTROW, professor of psychology in the University of Wisconsin, gave three lectures on "The Sensibilities," "The Emotions" and "The Appraisal of Human Qualities" at the summer session of the University of California.

PROFESSOR MORTON PRINCE has retired from the active duties of the chair of neurology in Tufts College Medical School, and becomes professor emeritus. He is succeeded by Professor J. J. Thomas, now assistant professor of neurology.

MR. WILLIAM McDUGALL, F.R.S., Wilde reader in mental philosophy at Oxford, has been elected an extraordinary fellow of Corpus Christi College.

GEORGE R. WELLS, Ph.D. (Hopkins, '12), has been appointed instructor in psychology at Oberlin College.

L. R. GEISSLER, Ph.D. (Cornell), has resigned his position as research psychologist in the Physical Laboratory of the National Electric Lamp Association, Cleveland, to become professor of psychology at the University of Georgia. He will organize and direct the new psychological laboratory to be established in connection with the School of Education.

THE board of trustees of Colgate University has created a new office, that of vice-president of the university, and has elected Dr. Melbourne Stuart Read to the office. Dr. Read is professor of psychology and has been secretary of the university for several years.

MR. EDGAR A. DOLL has been appointed associate psychologist in the department of research of the Vineland Training School, Vineland, N. J.

DR. WILHELM WUNDT, professor of philosophy in the University of Leipzig, one of the founders of modern psychology, celebrated his eightieth birthday on August 16, on which occasion a "Wilhelm Wundt Stiftung," amounting to 7,000 Marks, was presented to the university by his students and friends.

DR. GUY MONTROSE WHIPPLE, of the School of Education, Cornell University, gave three lectures on "The Training of Memory," "The Psychology of the Marking System" and "The Supernormal Child" at the summer session of the University of Illinois.

WALTER FENNO DEARBORN, Ph.D. (Columbia), recently professor in the school of education of the University of Chicago, has been appointed assistant professor of education at Harvard University.

ANNOUNCEMENT.—The business department of the Psychological Review Company will hereafter be located at Princeton and all business communications should be addressed to PSYCHOLOGICAL REVIEW COMPANY, PRINCETON, NEW JERSEY.

THE PSYCHOLOGICAL BULLETIN

GENERAL REVIEWS AND SUMMARIES

THE RECENT LITERATURE OF MENTAL CLASSES

BY WARNER BROWN

University of California

The classification of men according to their mental traits is directed by numerous interests. Foremost at the present time is the practical interest of which the slogan is efficiency. Münsterberg (46) continues to herald the opportunity of the psychologist to help in the choosing of a vocation by establishing a proper classification of individuals according to their talents. Differences with regard to attention, memory, apperception, span of attention, fatiguability, time sense, mental rhythm, correspond to the definite requirements of different occupations. The intimate relation between this movement for a practical classification of talents with a view to economy and the broader movement for the more efficient management of all resources is noted. Zergiebel's paper (58) is also typical of the practical point of view. Instead of regarding the variety of individual ability or gift as itself material for the exercise of psychological curiosity, it regards the possibility of usefully applying the various gifts and of compensating for the deficiencies. In the case of the elementary teacher who must teach a variety of subjects for which he has no personal aptitude, study of his own idiosyncracies of imagery, learning type, and type of observation, is of the first importance. For Chambers (8) the practical recognition of individual differences of mental make-up should entail in education "not so much the presentation of different subject-matter to different pupils as the affording of opportunity for individual reactions to the same subject-matter." Jones (30) finds that there is the necessity in democratic society of determining temperaments in order to avoid

misfits. He considers temperament as the total manner of reacting upon the situation, and follows Ribot in discriminating four types, active, sensitive, apathetic, and unstable or nervous. Many men of genius are cited who display neurotic traits or have a neurotic family history. Huther (26) is concerned with the modern demand that the schools fit people for performing such functions in life as they are naturally fitted for. This ideal is not in perfect accord with the chronic attempts of the schools to round out the character by giving greatest attention to the child's weak points.

A somewhat different practical application of the notion of mental classes is seen in the working out by Healy and Fernald (21) of a set of tests, to be applied to delinquent youths, which make possible a system of mental *classification* as distinguished from a system of *grading* applicable to individuals of the same intellectual age. The authors find it feasible to distinguish, aside from the subnormal cases, three grades of native ability, three grades of formal educational advantages, and two grades of information, with classes corresponding to the combinations of these grades. De Sanctis (13) points the way to the gap which Healy and Fernald have already so successfully closed when he says that tests of elementary mental functions, sensation, attention, memory, do not measure the general level of intelligence. The Ebbinghaus completion method and the Binet description of an object he approves of. His own "measuring scale" is intended primarily for measuring amounts of mental deficiency. The Binet scale he finds satisfactory for grading normal and slightly atypical children. Bell (3) cites a number of new contributions to the literature of "tests" which lie somewhat beyond the province of the present paper.

A like interest in sorting men into round and square according to the holes which they are to fill is to be seen in most of the work dealing with the correlation of traits and the fundamental question whether ability in the individual manifests itself generally or whether it appears in streaks. The clearest statement of this thought is found in the paper by Hart and Spearman (20). They find very strong evidence for the existence of a "general factor" which remains a constant through all the phases of the mental life of an individual. They conceive of the establishment of an "intellectual index" for all school children and eventually for the entire population. Class distinctions in society on a purely psychological basis become a remote possibility with the notion of a minimum intellectual index as a qualification for voting and for the privilege of having children. The

argument for the existence of the "general factor" is based in the first place on a correlation of correlations covering all of the available studies in the correlation of mental traits for the past thirty years, the results of the work of 14 experimenters on 1,463 persons. A table is arranged in the form of a square, showing the coefficient of correlation of each trait with each other trait. Then these coefficients are themselves correlated. For example the coefficients in which "memory" figures are correlated with the coefficients in which "touch" appears. If the various traits correlating more or less closely with memory and with touch are independent of each other, then no correlation of correlations will appear. If the various traits belong to different "levels" or mutually exclusive "types," as is generally held, there will be a negative correlation of correlations. If the various traits are all related to one another on the basis of a common factor, the correlation of correlations will be positive and high; and this is what proves to be almost invariably true. A second argument for the general factor is found in the working applicability of the modern mental "tests" which do not attempt to measure special abilities but are haphazard samplings the results of which are pooled together into a general estimate of mental standing. Specific abilities are not, however, lost sight of. "Every intellectual performance may be regarded as springing from two distinct factors: on the one hand the specific ability or disposition for that particular performance; and on the other general ability, due to the common fund of intellectual energy." A good example of the maxim that anything can be proved by figures is found in the original presentation by Brown (5) of an important part of the data on which Hart and Spearman found their contention for "general ability." Brown finds in the very low correlations between his different tests (which were numerous and varied and participated in by six distinct groups of students) no indication of a general factor underlying the separate functions measured. It is not possible to discuss here the relative merits of the methods employed by Brown and by Spearman (20) or the criticisms of the latter on Brown's methods. In the case of schoolboys' ability in arithmetic, geometry and algebra, Brown (4) also finds the correlations low except as between arithmetic and algebra. Lobsien (39) with one class of boys between 12 and 15 years of age finds high correlations between all the school subjects. When the record in a formal memory test is correlated with students' grades in separate subjects rather than their class standing Busemann (6) finds positive results. Lobsien (38), on the other hand, finds all the

correlations low between auditory or visual memory for numbers and mental or written arithmetic. The only appreciable positive correlation is between mental and written work. It is a curious reflection which is cast on this work by Huther (27) who, without any criticism on the manner or method of Lobsien's experiments, concludes on the basis of purely abstract deductive reasoning that there can be no connection between visual memory and mental calculation and therefore that a slight negative correlation which Lobsien found between these functions merely means the *absence* of connection. Surely, he thinks, there are visual-concrete and auditory-abstract types in calculating and these are to be regarded as "specific differences of endowment."

The question of special types of ability *vs.* general ability comes up again under the guise of formal training, *i. e.*, training through general ability or through the interconnection of special abilities. De Sanctis (13) says that experimental psychology can as yet throw no light on the training of general intelligence. Winch (57) attains a golden mean with the doctrine that there may be an improvement in one faculty as the result of training another, although there may not be any correlation between the faculties. Johnny, who has a good rote memory, may have a very poor associative memory (lack of correlation) but yet training of his rote memory may improve his associative memory (formal training). Thus the ground is cut out from under one of the chief arguments in favor of a general mental ability through which the different faculties are connected with one another. Elsenhans (14) sees that the so-called simple traits can only be arrived at from the more complex traits of actual mature experience, and that those complex traits are more than mere bundles of simple traits. His paper is typical of the absorbing interest in individual capacities, their origin and interrelationship, which dominates the first volumes of the combination of the *Zeitschrift für pädagogische Psychologie* with the *Zeitschrift für experimentelle Pädagogik*.

The discussion by Stern, Ephrussi, and others of Exner's (15) paper at the fourth *Kongress für experimentelle Psychologie* shows again the growing interest in the inheritance of human characters and the necessity of determining *what a character is* before we can discuss its inheritance intelligently. Josefovici (31) maintains that the inheritance of talents and character is possible either from both parents to the same child or from one parent only. Sisson (51) throws the emphasis upon innate tendencies by pleading for their

cultivation and redirection, abandoning the hope of reforming character by the imposition of entirely new habits. Reid (47) and Walker (52) discuss back and forth their disagreements over Pearson's logic by which he seems to say that human qualities are *bred not cultivated*, when he is only warranted in saying that they are bred *and* cultivated. Feis (16) shows that most musicians have sprung from musical families, but he fails utterly to distinguish their blood inheritance from their social inheritance,—true inheritance from the influence of favorable surroundings. Huther (25) attempts in a purely theoretical way to disentangle the factors entering into "native talent" and to discover which of these factors is capable of cultivation.

With regard to the modification of mental classifications as the result of practice Whitley (56) concludes, after practicing different persons upon different tests of individual capacity, that "the criticism that practice may influence individuals each according to a law of his own, and processes each by a law of its own, does not seem to hold so far as the general law of improvement goes." On the other hand Wells (54) finds that practice in the Kraepelin addition test and in a number-checking test reveals: (1) a difference in the individuals' fundamental plasticity in the function; (2) a difference in the actual amount of practice *experienced*; (3) constitutional factors in the nervous system independent of plasticity. Furthermore, both efficiency and plasticity are specific in the test, *i. e.*, different in the same individual from one test to another. Wells (53) also reports that the "type" as well as the speed of free associations is amenable to practice.

The development of *methods* for the determination of mental types occupies the attention of several workers. The report of Angell (2) to the American Psychological Association gives a catalog of twenty tests in current use for the determination of mental imagery with recommendations concerning the more suitable of them and with the warning that "types" do not follow the lines conventionally laid down, and that it is more difficult to establish the facts regarding them than is commonly supposed. The new methods devised by Healy and Fernald (21) have already been mentioned. Whitley (56) has made an experimental study of 45 tests of individual differences by correlating the results of the several tests with one another. There is also an historical review and general catalog of such tests. Her exceedingly guarded conclusions leave some doubt as to the practical value of the tests. Wharton's (55) tests of the imagery of school children by ten widely used methods yield such contradictory data

that he questions the validity of any method of determining the image type of children. Meumann (44) presents a new method for measuring the mental ability of children, which consists in giving two words from which a sentence is to be constructed; e. g., "soldier—fatherland." More or less logical sentences result. A modified form of the Ebbinghaus completion test is also described, in which the subject fills out the body of a story from certain key words. These tests give both qualitative types of intelligence and gradations of ability. Meumann distinguishes eight "types" of intelligence of which the first four give senseless sentences. The remaining four types are characterized as follows: the fifth by uncontrolled fantasy; the sixth by merely logical connection without ornament; the seventh by emotionally toned imagination; the eighth by logical connections plus imaginative detail. Furthermore he distinguishes two main classes of those who comprehend and stick to the task and those who do not, independent of the typical differences of gift in feeling, reasoning and imagination. The data from the new tests correlate poorly with class standing. He suggests modifications of these tests in the direction of greater explicitness in the task. A somewhat similar method of determining the type of imagination is reported by Fischer (18). Children are allowed to construct quasiooriginal parallels to familiar jingles like the "House that Jack built." The retention of rhythm, sense-content, etc., gives an indication of the child's mental type. Lipmann (36) presents a program of tests for the use of anthropologists.

Marbe's method of immediate systematic introspection is applied by Feuchtwanger (17) to the determination of mental types. The type for him is determined by the frequency of the ideas belonging to the different sense realms rather than by their vividness. The chief experimental controls used were listening to words, letters, syllables and sentences read out to the subject, and copying words, letters, etc., by the subject. Stimulation of any sense did not affect the type in such a way as to reduce the frequency of ideas belonging to that sense. A special lookout for a rare form of image did not increase the frequency of images of that kind. The "type" is connected with ability to call up voluntarily images of its own kind. Feuchtwanger also describes a new indirect method which consists in writing lists of words (Kraepelin) for objects of a certain height or color, or containing a certain vowel sound. In this case the subject has to *think* for each word. Also, the word-type is automatically separated from the object-type. The results of this indirect method agree perfectly

with the classification by the direct method of the four subjects employed.

The more fundamental methods of determining intellectual status are enumerated by Meumann (42) as follows: (1) psychiatric; (2) the distinction between normal and abnormal; (3) the determining of normal types and individual capacities; (4) determination of standards of mental ability for normal children of different ages. All tests must be *functional*, not merely measures of the amount of acquisition; and they must be as nearly tests of *general* intelligence as may be. Little is said under division three, but prominence is given to methods of correlation. Margis (41) classifies the general methods of another basis into: (1) the method of intuitive description, including the observation of physiognomy, hand-writing, etc., and also including the use of anecdotes; (2) the method of classification into established "types" of character, later development of the doctrine of temperaments; (3) the telegraphic method,—a description of the inner calling of a man, his specific gift; (4) the analytic, scientific, or psychological method, which is not a different method but a superior way of carrying on the work of all the other methods. An account is given of the record and program in this direction of the *Institut für angewandte Psychologie*.

More "psychographies" (Stern) and more and better questionnaires in the study of mental classes are urged by Heymans (22). He himself has read 110 biographies and found a high correlation involving such traits as mendacity,—seventy per cent. of the non-active emotional type proving liars, while none of the non-emotional active type were liars. He also digested the answers to questionnaires covering the family history of 2,523 persons in 458 families and found similar correlations of traits.

Alongside of the newer practical interest in mental classes as the basis of efficient utilization of human energy there still persists the interest, which may be called classical, in the variety of human endowment and faculty simply as an array of curious phenomena. Purely psychological description still delights in the pageant of men's differences in sensitivity, in imagery, in will, memory, and manner of forming associations. Various types of school children are reported on by Münch (45). Some individuals can be classified at once; some only after they have had time to become adapted to new surroundings. Some are naturally industrious and averse to diversions. Some types are indicated in play-activities. Surprising extremes of ability are found by Chambers (8) among children. No trait is

distributed in a normal curve. Among students Jones (29) finds that the learning types are so pronounced that presentation of material in only one sense-form works a material hardship on a considerable part of the class.

Some of the peculiarities of the contents of the visual space of the imagination, particularly in mathematical thinking, are described by Keyser (33). A census of images representing the concept "meaning" was taken by Chapin and Washburn (9) in a class of college women. Of 193 "good introspections" there were 50 per cent. reporting visual images, 37 per cent. wholly kinesthetic, and 13 per cent. visual and kinesthetic combined. Nearly all of the images, particularly the kinesthetic ones, were obviously relevant to the concept.

Typical differences in the manner of forming associations in reacting to a simple question are reported by Levy-Suhl (35) for the insane under the following heads: (1) Natural reaction; (2) generally indifferent hyperprosexia; (3) selective hyperprosexia; (4) hyper-vigile reactions. Wells (53) provides a useful glossary of his own and Jung's names for types of reaction in association. Dauber (12) reports on experiments in which numerous persons react with the same word to a given cue. In the case of nonsense syllables there were certain typical preferences. Out of 31 persons 12 tended to react by rhyme, 4 by alliteration, 8 by annexing a suffix to the cue, 2 by repetition. Huber (24) performed a similar experiment among fresh recruits and old soldiers and came to the conclusion that a large allowance must be made for the surroundings of the subjects and the differences in their training.

Scott (48) finds that "suggestibility" is not a single trait. Two different tests of suggestibility fail to correlate with each other.

With regard to attention McComas (40) finds that there are two large types with respect to span: broad and narrow. Those persons with a broad visual span have also a broad auditory span. There is also an alert as opposed to a sluggish type. The ability to concentrate, or inhibit, or to dexterously manage the attention does not take the form of a "type."

Lipmann (37) insists that there is not a visual type, but that color-tone, brightness, saturation, size, position, each has a special type of imagery. Experiments in the recognition of geometrical forms of various sizes, variously colored, agreed closely with introspections. Three hundred school girls who were tested tended to employ the same partial visual imagery on a second trial.

A peculiar special trait, fertility of expression, or the ability to produce an elaborate and detailed representation of an object, is found by Cohn and Dieffenbacher (11) to reveal itself consistently in tests involving description, testimony, written composition and drawing.

Meumann (43) introduces an entirely new basis of mental classification in his combination factor. Certain persons can employ certain forms of imagery successfully alone but not in combination, *i. e.*, in thinking. A case is analyzed in which there is excellent visual and excellent auditory-motor imagery and memory but great difficulty in forming associations between the two classes of objects. A map can be visualized and a list of names easily learned by rote but there is difficulty in locating a name on the map.

The concept of character and types of character is considered from the theoretical standpoint and in relation to will and feeling by Klages (34), Ach (1), Selz (49, 50) and Kerschensteiner (32).

The musician as a special type is analyzed by Feis (16). Musical genius shows itself precociously as either: (1) appreciation of rhythm; (2) creative ability (in a few); (3) the ability to reproduce a piece (tone memory). Most musicians have an abundance of other talents, but none of the great composers had ability as a teacher; a fact which must be consoling to many teachers of music. Musicians are industrious. Although musical geniuses show many stigmata of nervous disease Feis does not agree with Lombroso concerning the relation between genius (in the case of musical genius) and degeneration and epilepsy. Hinrichsen (23) thinks that no one will deny that there are types of disposition for poets, musicians, painters and mathematicians as well as for criminals. He analyzes the poetic disposition in the autobiographical and anecdotal manner, concluding that the poet's state of mind is like that of the ordinary dreamer; poetic fancy is not allied to hallucination. The poet is not necessarily (though he is frequently) neurotic any more than any other intellectually productive person.

Numerous facts regarding the man of science are presented by Cattell (7), particularly with respect to his precocity and the kind of community from which he springs and in which he is nurtured.

That sex establishes two distinct mental classes in the community is the assumption upon which Glaser (19) bases a feminist plea. The assumption is prominent in the elaborate experiments of Cohn and Dieffenbacher (10, 11), but their data and conclusions do not furnish a very strong argument for mental differences between boys and girls.

when allowance is made for the relative precocity of the girls. It is significant that when one sex excels the other in any respect the best scholars of the inferior sex partake of the excellence of the other sex.

Every phase of the subject of mental classes is touched upon in Jastrow's essay (28). So much material has been so finely minced and presented in so well digested a form that no summary can do justice to it, but its chief tendency is to throw the emphasis upon inheritance rather than attainment and particularly to call attention to differences of endowment in sensibility and in creative ability. "The closer inspection, through the analytical glasses of psychology, of the differentiating varieties of human quality and of their functional interplay, falls outside the range of this survey." The author's endeavor is rather to cultivate a truer social appreciation of those qualities which make their appearance among men, and particularly of those qualities which make it possible for their unfortunate possessors to render distinguished service to mankind. The essay epitomizes the current attitude in psychological thought toward individual talent, special endowment, general ability, and mental classification; but it is an essay, it does not argue nor does it hark back to authority.

REFERENCES

1. ACH, N. Willensakt und Temperament (Eine Widerlegung). *Zsch. f. Psychol.*, 1911, 58, 263-276.
2. ANGELL, J. R. Methods for the Determination of Mental Imagery. *PSYCHOL. MONOG.*, 1910, 13, No. 53, 61-107.
3. BELL, J. C. Recent Literature on the Binet Tests. *J. of Educ. Psychol.*, 1912, 3, 101-110.
4. BROWN, WM. Note on the Quantitative Analysis of Mathematical Intelligence. *J. of Philos., Psychol., etc.*, 1910, 7, 526-528.
5. BROWN, WM. Some Experimental Results in the Correlation of Mental Abilities. *Brit. J. of Psychol.*, 1910, 3, 296-322.
6. BUSEMANN, A. Die individuellen Korrelationen zwischen den Leistungen im Gedächtnisexperimente und denen im Unterrichte. *Zsch. f. angew. Psychol.*, 1911, 5, 341-344.
7. CATTELL, J. McK. A Further Statistical Study of American Men of Science. *Science*, 1910, 32, 633-648; 672-688.
8. CHAMBERS, W. G. Individual Differences in Grammar Grade Children. *J. of Educ. Psychol.*, 1910, 1, 61-75.
9. CHAPIN, M. W., and WASHBURN, M. F. A Study of the Images Representing the Concept "Meaning." *Amer. J. of Psychol.*, 1912, 23, 109-114.
10. COHN, J. Untersuchungen über Geschlechts- und Altersunterschiede bei Schülern. *IV. Kongress f. exper. Psychol.*, 1911, 219-224.
11. COHN, J., and DIEFFENBACHER, J. Untersuchungen über Geschlechts-, Alters- und Begabungsunterschiede bei Schülern. *Zsch. f. angew. Psychol.*, 1911, Beiheft 2, 1-213.

12. DAUBER, J. Ueber bevorzugte Assoziationen und verwandte Phänomene. *Zsch. f. Psychol.*, 1911, 59, 176-222.
13. DE SANCTIS, S. Mental Development and the Measurement of the Level of Intelligence. *J. of Educ. Psychol.*, 1911, 2, 498-507.
14. ELSENHANS, T. Zum Begriff der angeborenen Anlage. *Zsch. f. päd. Psychol.*, 1911, 12, 206-216.
15. EXNER, S. Bemerkungen zur Frage nach der Vererbung erworbener psychischer Eigenschaften. *IV. Kongress f. exper. Psychol.*, 1911, 203-210.
16. FEIS, O. Studien über die Genealogie und Psychologie der Musiker. *Grenzfr. d. Nerv. u. Seelenlebens*, 1910, 71, 1-97.
17. FEUCHTWANGER, A. Versuche über Vorstellungstypen. *Zsch. f. Psychol.*, 1911, 58, 161-199.
18. FISCHER, A. Methoden zur experimentellen Untersuchung der elementaren Phantasieprozesse. *Zsch. f. päd. Psychol.*, 1911, 12, 448-458; 497-507.
19. GLASER, O. C. The Constitutional Conservatism of Women. *Pop. Sci. Mo.*, 1911, 79, 299-302.
20. HART, B., and SPEARMAN, C. General Ability, Its Existence and Nature. *Brit. J. of Psychol.*, 1912, 5, 51-84.
21. HEALY, W., and FERNALD, G. M. Tests for Practical Mental Classification. *PSYCHOL. MONOG.*, 1911, 13, No. 54, 1-53.
22. HEYMANS, G. Des méthodes dans la psychologie spéciale. *Année psychol.*, 1911, 17, 64-79.
23. HINRICHSSEN, O. Zur Psychologie und Psychopathologie des Dichters. *Grenzfr. d. Nerv. u. Seelenlebens*, 1911, 80, 1-95.
24. HUBER, E. Assoziationsversuche an Soldaten. *Zsch. f. Psychol.*, 1911, 59, 241-272.
25. HUTHER, A. Ueber das Problem einer psychologischen und pädagogischen Theorie der intellektuellen Begabung. *Arch. f. d. ges. Psychol.*, 1910, 18, 193-248.
26. HUTHER, A. Probleme zur Charakter- und Begabungslehre. *Zsch. f. päd. Psychol.*, 1911, 12, 23-36.
27. HUTHER, A. Korrelationen zwischen Zahlengedächtnis und Rechenleistung. *Zsch. f. päd. Psychol.*, 1911, 12, 121-125.
28. JASTROW, J. *The Qualities of Men: An Essay in Appreciation*. New York: Houghton Mifflin Co., 1910. Pp. viii+183.
29. JONES, W. F. An Experimental-Critical Study of the Problem of Grading and Promotion. Part 2. *Psychol. Clinic*, 1911, 5, 99-120.
30. JONES, R. Temperaments: Is there a Neurotic One? *Lancet*, 1911, 181, 1-6.
31. JOSEFOVICI, U. Die psychische Vererbung. *Arch. f. d. ges. Psychol.*, 1912, 23, 1-155.
32. KERSCHENSTEINER, G. Der Charakterbegriff. *Zsch. f. päd. Psychol.*, 1912, 13, 7-18.
33. KEYSER, C. J. The Asymmetry of the Imagination. *J. of Philos., Psychol., etc.*, 1911, 8, 309-316.
34. KLAGES, L. Ueber Charakterkunde (Eine Erwiderung). *Arch. f. d. ges. Psychol.*, 1911, 22, 108-116.
35. LEVY-SUHL, M. Studien über die experimentelle Beeinflussung des Vorstellungsverlaufes (Dritter Teil.) *Zsch. f. Psychol.*, 1911, 59, 1-90.
36. LIPMANN, O. Vorschläge zur psychologischen Untersuchung primitiver

- Menschen. III, Gedächtnis und Auffassung. *Zsch. f. angew. Psychol.*, 1912, Beiheft 5, 55-65.
37. LIPMANN, O. Visuelle Auffassungstypen. *IV. Kongress f. exper. Psychol.*, 1911, 198-203.
 38. LOBSIEN, M. Korrelationen zwischen Zahlengedächtnis und Rechenleistung. *Zsch. f. päd. Psychol.*, 1911, 12, 54-60.
 39. LOBSIEN, M. Korrelationen zwischen den unterrichtlichen Leistungen einer Schülergruppe. *Zsch. f. päd. Psychol.*, 1910, 11, 146-164.
 40. McCOMAS, H. C. Some Types of Attention. *PSYCHOL. MONOG.*, 1911, 13, No. 55, 1-55.
 41. MARGIS, P. Das Problem und die Methoden der Psychographie. *Zsch. f. angew. Psychol.*, 1911, 5, 409-451.
 42. MEUMANN, E. Der Gegenwärtige Stand der Methodik der Intelligenzprüfungen. *Zsch. f. exper. Päd.*, 1910, 11, 68-79.
 43. MEUMANN, E. Ueber den Kombinatorischen Factor bei Vorstellungstypen. *Zsch. f. päd. Psychol.*, 1911, 12, 115-120.
 44. MEUMANN, E. Ueber eine neue Methode der Intelligenzprüfung und über den Wert der Kombinationsmethoden. *Zsch. f. päd. Psychol.*, 1912, 13, 145-163.
 45. MUENCH, W. Schülertypen. *Zsch. f. päd. Psychol.*, 1911, 12, 14-23; 106-114.
 46. MUENSTERBERG, H. Experimentalpsychologie und Berufswahl. *Zsch. f. päd. Psychol.*, 1912, 13, 1-7.
 47. REID, G. A. The Inheritance of Mental Characters. *Nature*, 1911, 88, 210-211.
 48. SCOTT, W. D. Personal Differences in Suggestibility. *PSYCHOL. REV.*, 1910, 17, 147-156.
 49. SELZ, O. Die experimentelle Untersuchung des Willensakts. *Zsch. f. Psychol.*, 1910, 57, 241-270.
 50. SELZ, O. Willensakt und Temperament (Eine Erwiderung). *Zsch. f. Psychol.*, 1911, 59, 113-122.
 51. SISSON, E. O. *The Essentials of Character*. New York: Macmillan, 1910. Pp. x+214.
 52. WALKER, C. The Inheritance of Mental Characters. *Nature*, 1911, 88, 110, 175-176; 278.
 53. WELLS, F. L. Practice Effects in Free Association. *Amer. J. of Psychol.*, 1911, 22, 1-13.
 54. WELLS, F. L. The Relation of Practice to Individual Differences. *Amer. J. of Psychol.*, 1912, 23, 75-88.
 55. WHARTON, W. P. *Experimental Study of Ideational Types of School Children*. New York: publ. by the author, 1911. Pp. 120.
 56. WHITLEY, M. T. An Empirical Study of Certain Tests for Individual Differences. *Arch. of Psychol.*, 1911, No. 19, 1-146.
 57. WINCH, W. H. The Faculty Doctrine, Correlation, and Educational Theory. *J. of Philos., Psychol., etc.*, 1911, 8, 337-348; 372-384.
 58. ZERGIEBEL, M. Zur Psychologie des Lehrers. *Zsch. f. päd. Psychol.*, 1911, 12, 471-483.

FOLK-PSYCHOLOGY

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Folk-psychology has not yet reached the happy condition of "the ship that found herself." Its scope, its method, are matters of dispute, its *raison d'être* even is in some quarters accepted with hesitation. It would hardly be profitable to discuss here the methodological and terminological questions involved; some of the more important issues, however, will be incidentally touched on in the course of this review.

Thurnwald (12) observes that in primitive conditions there can be no question of formal legal categories; savage law is simply savage custom looked at from a certain point of view. It follows that we cannot make use of our own legal abstractions in describing the legal forms of primitive folk. He further notes that savages do not always live up to their reputation as good observers; the people of Buin (Bougainville, Melanesia), for instance, are unaware of the connection between the caterpillar and the butterfly. The inhabitants of the Gazelle Peninsula assert that children found in the bush are the fruit of a liana. Thus we need not wonder at the ignorance of some peoples with reference to the processes of sexual conception; an ignorance which results in multiform whimsical beliefs as to the relations between man and plants and animals. Thurnwald's remarks about blood revenge in Melanesia are interesting. The avenger may meet his victim in open combat or he may suddenly attack him from ambush. Nor is it necessary for the act of vengeance to occur at once or within a defined period. If the offender is strong and powerful, well protected and hard to get at, vengeance may be postponed for months and years; but sooner or later the fatal blow will fall.

Kroeber (7) points out that the still current belief that conduct may be determined by ideas or reason is a delusion. The opposition also to some actions, as cannibalism, incest, lack of parental or filial devotion; "is so thoroughly instinctive that these crimes have hardly had to be dealt with by most people, and their rarity and want of infectiousness are recognized in the failure of creeds and codes to provide against them." While the horror of incest, pollution, etc., is common to all people, the ideas as to what constitutes incest or pollution vary greatly from place to place and from time to time.

Stumpf (10) criticizes Darwin's theory of the origin of music from

song; Spencer's theory of its origin from emotional speech; Wallaschek's, from dancing; Bücher's, from communal labor. Music, for Stumpf, is characterized by definitely fixed but transposable intervals. The origin of music he finds in vocal signs at a distance. Thus certain sounds became fixed in pitch and were sustained longer than in ordinary speech. Later, intervals, beginning probably with the octave, arose. Religious motives may have coöperated in the early development of music. Stumpf gives valuable bibliographic references and a collection of primitive songs and tunes.¹

Thurnwald attempts to characterize the mental atmosphere (*Denkart*) reflected in totemism (II). He also emphasizes the social aspect of that institution. "Der Totemismus ist eine sociologische Theorie, die auf einer bestimmten Naturauffassung von den Existenzbedingungen des Menschen basiert ist." And again, "Von Totemismus aber sollte man nur dann reden, wenn Anzeichen vorhanden sind, die auf eine durch die geschilderte eigenartige Denkart beeinflusste soziale Gestaltung schliessen lassen."

Sapir (9) draws attention to some common elements in all languages, such as a fixed phonetic system and a definite grammatical structure. With reference to older theories of the origin of speech he observes that "we are forced to conclude that the existence of onomatopoetic and exclamatory features is as little correlated with relative primitiveness as we have found the use of gesture to be." The probable origin of phonetic changes is seen in the inexact imitation by children of the pronunciation of elders. Some of the phonetic variants thus produced are imitated by others until either the entire language is changed phonetically or a separate dialect arises. It seems that the time-honored characterization of languages as inflectional, agglutinative, etc., must be set aside. We may speak of derivative elements in language, elements which affect only the form of the word, and of relational elements which, while affecting the form of the word, also affect its relation to other parts of the sentence, which, in consequence, also change. In this connection "it is important to note that, although the distinction between derivational and relational grammatical elements we have made is clearly reflected

¹ The value of music for folk-psychology has only recently been realized, and the number of careful studies on the subject is exceedingly small. Professor Stumpf and his excellent collaborators, Abraham and von Hornbostel, are pioneers in this work. I must here refer to his *Beiträge zur Akustik und Musikwissenschaft* (6), which reached me too late for a more detailed review. Sapir's "Song Recitative in Paiute Mythology" (*J. of Amer. Folk-lore*, 1910, 23, 455-473) should also be consulted for interesting hints as to some specific relations between primitive music and mythology.

in some way or other in most languages, they differ a great deal as to what particular logical concepts are treated as respectively derivational and relational."¹

Rivers (8) insists that in many instances where primitive beliefs contain apparent contradictions, these resolve themselves into perfectly logical sequences if allowance is made for the fact that natural phenomena "have been classified and arranged into categories different from those of ourselves." A case in point is afforded by the Melanesian concepts of life and death, which do not coincide with our own but are expressed by the terms *mate* and *toa*, one including with the dead the very sick and the very aged, while the other excludes from the living those who are called *mate*. Rivers believes that the states "on either side of this condition of *mateness*" are much less different, to the primitive mind, than are for us the states indicated by the terms life and death. Death to the primitive man is a form of existence, and "the difference between the two existences is probably of much the same order to the primitive mind as two stages of his life, say the stages before and after his initiation into manhood."²

Boas (2), in his Clark University lecture, deals with the psychological problems in the study of ethnology. On the one hand the anthropologist seeks to reconstruct the historical development of cultures; on the other hand he is interested in the psychological laws underlying the thought and action of man, in different racial and social groups. On close analysis the "composite pictures" of the mental make-up of different races would probably reveal significant differences. The performance of individuals belonging to a given group may to some extent depend on hereditary individual and racial ability, but in the main it depends on the habitual characteristics of the social group to which the individual belongs. The main difficulty with the comparative method commonly used by ethnologists is the incomparability of the data on which the conclusions are based. "The person, for instance, who slays an enemy in revenge for wrongs

¹ It becomes increasingly apparent that the field of primitive languages will soon prove a treasure-trove to the folk-psychologist. For quite apart from the value of language as a mirror of culture, the classification of experience and the categories of concepts unconsciously expressed in the grammatical structure, vocabulary, and even phonetics, of a language, and which are now being laid bare by the student, promise to reveal to us the sanctum of mental life, the laboratory of thought itself. I commend to the attention of psychologists the *Handbook of American Indian Languages* (Bulletin 40 of the Bureau of Ethnology).

² Lévy-Bruhl has reached much the same conclusion in his *Les Fonctions Mentales des Sociétés Inférieures*. See the present writer's remarks on Rivers and Lévy-Bruhl in *Current Anthropological Literature*, 1912.

done, a youth who kills his father before he gets decrepit in order to enable him to continue a vigorous life in the world to come, a father who kills his child as a sacrifice for the welfare of his people, act from such entirely different motives that psychologically a comparison of their activities does not seem permissible." Thus two phenomena are culturally similar, not when they reveal objective resemblances, but when the underlying psychological processes are similar.¹

The classification of experience underlying the thought of different groups of men is thoroughly different. This classification of experience is not due to any ratiocinative process but occurs unconsciously. The best example of classifications which do not rise into consciousness is offered by the grammatical categories of languages; but it is no less plausible that some of the fundamental concepts of religion as well as of other cultural phenomena, have arisen in the same unconscious way; with the difference that in the latter instances the fundamental concepts, and in part the underlying classifications, tend to rise into consciousness. The subsequent conscious elaboration of the concept leads to secondary explanations, the study of which constitutes a highly important branch of ethnology.

Woodworth (14) examines the same facts from a somewhat different angle. He warns against the hasty assumption of specialized mental traits in different groups. "The circumstances surrounding a group call for certain special abilities and bring to the fore individuals possessing these abilities, leaving in comparative obscurity those gifted in other directions." Woodworth dismisses with little ceremony the oft made assertions that savages are deficient in reasoning powers, that they are incapable of abstraction, of foresight. The difference in these respects between the savage and civilized is only one of degree. The author proceeds to analyze the results of investigations on the senses of savages conducted by Rivers, McDougall and Myers, among the islanders of Torres Straits, and of his own experiments with several primitive groups at the St. Louis Fair in 1904. In the light of these data the sense superiority of the savage is as much of an illusion as his mental inferiority seems to be. Woodworth thus reaches the conclusion that the progress made by a group cannot be conceived as determined solely by its intellectual endowment. "The spur of necessity, the opportunities afforded by leisure, the existing stock of knowledge and inventions, and the factor of apparent accident or luck have all to be considered."

¹ Boas has emphasized this point of view in several previous publications as well as in his recent *The Mind of Primitive Man*. (See special review on p. 404.)

Graebner (5) lays down the principles of the science of ethnology and the method of ethnological inquiry. We are particularly concerned with pp. 62-124 of his work. He starts out with the proposition that two cultural phenomena possess the greatest mutual interpretative value if they belong to the same cultural complex. If then we want to interpret culture we must reconstruct the cultural complexes that have developed, spread and fused in the course of the historic process. This is the main aim of ethnology. The geographical separation of cultural areas complicates our investigations, but it should not in principle affect our attitude towards cultural similarities. As independent development of similarities in culture is rare and convergent, evolution is to a large extent an imaginary process; such cultural similarities, however distant geographically, must be interpreted as due to historic contact, and, in the last analysis, to genetic relationship. The actually existing cultures which confront the ethnologist are valuable to Graebner only in so far as they constitute the points of departure for his cultural reconstructions. Needless to say, all intensive analysis of the interplay of psychic forces in any given cultural area does not, for Graebner, fall within the scope of the ethnologist's task. There is no more room for the soul in Graebner's system than there was for God in the universe of Laplace.¹

We must pass by without comment Ankermann (1) who is a more cautious representative of the "historical" school of ethnology, and Foy (4) whose position is even more extreme than that of Graebner.

Boas (3) characterizes Graebner's system as "mechanical." He sees safe progress in "the patient unravelling of the mental processes that may be observed among primitive and civilized peoples, and that express the actual conditions under which cultural forms develop. When we begin to know these we shall also be able to proceed gradually to more difficult problems of the cultural relations between isolated areas that exhibit peculiar similarities." The

¹ The full significance of Graebner's methods as well as their bearings on the problems of folk-psychology cannot be fully appreciated without acquaintance with his concrete investigations. See particularly his "Die Melanesische Bogenkultur" (*Anthropos*, 1909), "Die Wanderungen sozialer Systeme in Australien" (*Globus*, 1906), and "Die sozialen Systeme der Südsee" (*Zsch. f. Sozialwissenschaft.*, 1908). Also Graebner's and Foy's discussion with Haberlandt in *Petermann's Mitteilungen*, March and May, 1911. Dixon meets Graebner on his own ground in "The Independence of the Culture of the American Indian" (*Science*, 1912, 35, No. 889). Lowie defends the principle of convergence against Graebner's challenge of its non-existence (*J. of Amer. Folk-lore*, 1912).

significance of cultural phenomena lies in their psychological setting. Against Graebner, Boas maintains "that certain types of changes due to internal forces have been observed everywhere."

Wundt (15) once more formulates his conception of folk-psychology. Although it is true that no psychic process may occur outside an individual consciousness, many processes in the individual mind cannot be properly understood when abstracted from their social context. The metaphysical concept of a soul and the fiction of "laws" must be set aside. The soul is naught but the sum total of psychic experience; the psychic laws are the regularities of that experience. If so much is granted, the ethnic soul (*Volksseele*) becomes as proper a field for psychological investigation as is the individual soul. Particular developmental processes become the subject-matter of folk-psychology only in so far as they contain common elements based on the psychic unity of man, a condition represented by remote social origins. In later stages, as outer and inner social forces increase in particularity, number and variety, the common fundamental psychic motives become obscured and are carried off with the flood of historic conditions. Thus folk-psychology and individual psychology constitute the foundation of history, not *vice versa*. Individual psychology furnishes the clue for the solution of folk-psychological problems; folk-psychology, on the other hand, itself supplies valuable material for individual psychology. Thus linguistic phenomena throw light on the processes of thinking; mythology, on the workings of imagination; custom, on the nature of will.

A number of German psychologists and ethnologists contribute a set of suggestions for the psychological study of primitive peoples. Thurnwald (13) joins Lévy-Bruhl in advocating the necessity of a psychological characterization of ethnic groups.¹

Hayes (6), in a series of articles, champions the psychological view of society. He analyzes the views of Tarde, Spencer, de Greef, Fairbanks, Ross, Giddings. "Society," he defines, "is in essence the interrelated activities of men," and activities are psychic facts, while the connotations of the term "interrelated" are, in this connection, also psychic. Wundt's view as to the relation of individual to social psychology is endorsed. "Individual" psychology is really "general" psychology, for it deals with what is universal in man. "It is sociology that investigates the building up of the content of consciousness which differs at different times and places, the indi-

¹ See special review on p. 400.

vidual's share in which constitutes his individual life, a life composed of activities which have been socially evolved and which by each individual are socially derived. The individual is a concrete, complex, unanalyzed sample of the social reality." In criticizing Giddings, Hayes repudiates the time-honored view of society "as a population of human organisms, under political control, inhabiting a given territory."¹

The narrow limits of this review prevent me from treating this problem of the objective versus the psychic method of studying man and society with the care it deserves. I believe that ethnologists as well as sociologists are divided over the question. We see a somewhat striking example of convergence in thinking in that the psychologist and the professional philosopher also find themselves facing a similar situation. I refer to such works as Thorndike's *Animal Intelligence* (1911), particularly the last two chapters; the introductory chapters of Pillsbury's *The Essentials of Psychology*; the whole of McDougall's *Introduction to Social Psychology*; as well as the discussions at the recent meeting of the American Philosophical Association, in Cambridge. The situation is fascinating and somewhat ominous. Need we fear that the word *Geisteswissenschaften* will reveal itself as a contradiction in terms?

REFERENCES

1. ANKERMANN, B. Die Lehre von den Kulturkreisen. *Korrespondenzblatt der deutschen Gesellschaft f. Anthropol., Ethnologie u. Urgeschichte*, 42, 156-162 (in *Arch. f. Anthropologie*, 1911, 10⁴).
2. BOAS F. Psychological Problems in Anthropology. *Amer. J. of Psychol.*, 1910, 21, 371-384.
3. BOAS, F. Review of Graebner's "Methode der Ethnologie." *Science*, 1911, 34, 804-810.
4. FOY, W. *Führer durch das Rautenstrauch-Joest Museum*. Köln, 1910.
5. GRAEBNER, F. *Methode der Ethnologie*. Heidelberg: Carl Winter, 1911.
6. HAYES, E. C. The Classification of Social Phenomena. *Amer. J. of Sociol.*, 1911, 17, 90-118; 188-205; 375-399.
7. KROEBER, A. L. The Morals of Uncivilized Peoples. *Amer. Anthropologist*, July-September, 1910.
8. RIVERS, W. H. R. The Primitive Conception of Death. *The Hibbert J.*, 1912, 10, No. 2.

¹The inclusion of an article on sociology in a review of folk-psychology may arouse criticism. I venture to submit, however, that sociology stands in the same relation to historic society in which folk-psychology stands to prehistoric society. The discussion of the scope and method of sociology by a number of German, English, and American students (*Amer. J. of Sociol.*, 1910) will be found suggestive in this connection.

9. SAPIR, E. The History and Varieties of Human Speech. *Pop. Sci. Mo.*, 1911, 79, 45-67.
10. STUMPF, C. *Die Anfänge der Musik*. Leipzig, 1910.
11. THURNWALD, R. Die Denkart als Wurzel des Totemismus. *Korrespondenzblatt der deutschen Gesellschaft f. Anthropologie, Ethnologie u. Urgeschichte*, 1911, 42 (in *Arch. f. Anthropol.*, 1911, 10⁴).
12. THURNWALD, R. Ermittlungen über Eingeborenenrechte der Südsee. *Zsch. f. vergl. Rechtswissensch.*, 1910, 23, 309-364.
13. THURNWALD, R. Probleme der ethno-psychologischen Forschung. *Beihefte zur Zsch. f. angewandte Psychol. u. psychol. Sammelforsch.*, 5, 1-27.
14. WOODWORTH, R. S. Racial Differences in Mental Traits. *Science*, 1910, 31, 171-186.
15. WUNDT, W. *Probleme der Völkerpsychologie*. Leipzig: Ernst Wiegandt, 1911.

THE PRIMITIVE RACES IN AMERICA

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The literature relating, specifically, to the psychology of the primitive races in America, during the past two or three years, is exceedingly meager, and indeed in most cases its psychological bearing is rather indirect.

In Part I. of the *Handbook of the American Indian Languages* (I) an attempt is made to bring together material bearing on the morphology and phonetics of the American languages with a view, ultimately, of organizing an analytical grammar. When more material has been collected in subsequent volumes, an attempt will be made to get hold of the phonetic processes involved in these languages, so as to discover the psychological foundations of their structure.

Boas, in the introduction of eighty-three pages, traces the significant social and psychological influences which have been factors in modifying phonal, articulatory and language complexes. His study brings out the fact that there is little correlation between language, material culture, and anatomical structure when these three elements are employed, respectively, to determine ethnic relationship between groups of people. A difference in physical type, and customs, is noted when the language is common; or one finds the anatomical type the same, but the language and the social customs at wide variance, and so on. This makes it fairly certain that sets of influences may act now in one direction and now in another. Boas's conclusion is that the biological unit is safest as being the most inclusive and permanent, since, obviously, anatomical structure reacts

more slowly to changes than do either social customs or linguistic forms.

Considerable discussion is given to the inherent nature of language forms, and attention is called to the very limited number of the possible phonetic elements that are actually employed in human speech. Boas holds that the influence which determines the particular group of phonetic elements that are used in a given language is their facility in articulation, since, all unconsciously, those phonetic elements are selected which make for the most rapid communication. All languages have a few phonetic elements in common, but each has some that are peculiar to itself. One tends to interpret the elements of a strange speech in terms of those phonetic elements with which he is familiar, and thus there arises always an error in placing correctly unfamiliar language forms. In this way one accounts for a fallacy that has frequently arisen, to the effect that primitive peoples are unable to differentiate phonetic elements. Different observers attribute to a group different forms of pronunciation, because of a personal error of observation. Boas finds no correlation between similarity in psychological traits of two peoples and their language structure, so that the morphological structure of a language is little related to the mental development of a people.

In the *Handbook* are presented also detailed language studies of the Athabascans, by Goddard; the Flenguit and Haida, by Swanton; the Tsimshian, Kwakuitl, and Chinook, by Boas; the Maida, by Dixon; the Algonquian, by Jones; the Siouan, by Boas and Swanton; and the Eskimo, by Thalbitzer. Thus there is made available some carefully prepared material for an exhaustive comparative Indian language study.

Bushnell (2) gives the results of an exhaustive study of twelve Choctaws, the remnants of a numerous people once living in the Bayou Lacombe region of Louisiana. A few artifacts were unearthed, which belonged to the prehistoric inhabitants. They indicate a relatively low state of culture, and indeed the present inhabitants in point of fundamental habits and customs have probably undergone but little change as the result of their associations with Whites for five or six generations. Their habitations are still crude, improvised shelters; their food habits primitive; their implements and forms of adornment simple and barbaric; nor do their forefathers seem to have given much attention to the spiritual or matters of spirit worship. Many of the original customs and beliefs still persist, such as the form of tribe and family organization, the institution of marriage,

customs associated with death and burial, the form of punishment for criminal offences. Bushnell found them still using their old games and pastimes, and there has persisted a firm belief in their historic myths (3) and superstitions. These relate to an account of the creation, the presence of sickness and evil, the origin of evil spirits, and many other myths having to do with the ordinary affairs of life. Suggestive of the simplicity and childlike character of their mental machinery, is the direct, uncritical and purely objective character of their explanations, which is in marked contrast with the symbolism of some of their neighbors and that of the northern Indians. The influence of their environment is directly apparent. The dense forests and swamps are regarded as the haunts of mysterious beings to whom they attribute all manner of personal injuries and unusual natural phenomena. Some of these beings are visible to the eye, the presence of others can be detected only by their sounds.

Eastman (5), himself an Indian, purports to give an analytical interpretation of the Indian mind, his religious nature, his concept of ceremonial and symbolic worship, his moral code and moral sense, and the subtle, spiritual, and ideal elements of his being. One is tempted to question, however, whether Eastman's Indian is not, like Hiawatha, more mythical than real; whether, indeed, he has not given us an æsthetic, highly ethical, and deeply spiritual, interpretation of a set of habits and customs, which was wholly foreign to the primitive Indian mind. Eastman tells us that rightly interpreted the Indian was a mystic, that he was always thinking of the deeper meaning of things, that to the Indian there was a spiritual and a physical mind, and that to the latter were relegated ceremonials, charms, incantations; affairs which had to do with personal safety, sickness, food, and other selfish interests. The spiritual mind deals only with the essence of things, and concerning the spiritual the Indian never spoke. Obviously then spiritual matters were wholly intuitive, and since he never related his thoughts concerning these matters, one could truly know only by inference whether the Indian felt them.

Eastman is writing doubtless of the Dakotas, since he pretends to speak from his own early experiences. These Indians believed they possessed a soul in common with animals, plants, and inanimate objects. They held to a future state but did not concern themselves as to its nature. We are told, they were logical thinkers on matters within their experience; that they were individualistic in such things as religion and war; and that they were fearless, death having no

dread, since life had value simply in the interest of family and friends, and when these interests demanded, one sacrificed his life gladly. The Indian was said to be courageous, as a matter of course, yielding neither to fear, danger, desire, or agony, it being disgraceful, only, to be killed in a private quarrel.

The one paramount mystic ceremony that the Sioux observed was the vapor bath, which was performed with great solemnity, and is said to have influenced the spiritual life of the partaker very profoundly.

Eastman's book is interesting reading. He has taken the precaution to say it does not pretend to be scientific, and indeed, it is of doubtful value as a contribution to our knowledge of the Indian mind.

Grinnell (7) has collected some legends relative to two sacred objects, and the mystic ceremonies connected with them, which the Cheyenne say have always belonged to their tribe,—the medicine arrows, and the sacred Buffalo Hat. With both these objects are associated also mystic culture heroes. The origin and purpose of the objects have to do with the warding off of danger, and the provision of food. In olden times, during a great famine, when the tribes were about to be stricken off, corn, buffalo and other game were brought by the mystic appearance of a strange old man and woman, who, however, remained with the tribe only a very short while, when they abruptly disappeared. Before leaving, they enjoined the tribe to certain observances, on penalty of a return of the famine should they lapse. Notwithstanding, through some oversight, the observances were not strictly kept and the threatened famine immediately followed. While away in search of food the Buffalo Hat was found and was brought into camp. Immediately it cast a spell which caused the buffalo and game to return, and the corn to grow. The origin of the medicine arrows is equally mystic. It is said that the hero who found the medicine arrows possessed rare spiritual powers. He could, for example, change his form to that of an eagle, a fox, a cloud, or simply vanish into vapor, and when fancy pleased return to his human form.

The Buffalo Hat and the medicine arrows have been cherished possessions of these tribes for generations. They afford spiritual protection; are talismans given them, they believe, by the spirits to help their people to health and plenty in time of peace, and in war to give them victory over their enemies. So long as proper reverence is given these relics, and the ceremonies associated with them are religiously observed, these protective gifts are helpful, but failure in

these matters has invariably led to misfortune, famine, and defeat by their enemies.

The Buffalo Hat typifies subsistence, the medicine arrows defence. The latter were medicine for men alone, the women might look upon them; the former was largely medicine for women. Grinnell (8) gives a detailed account of the ceremonies related to each of these objects, and the story of the capture of the arrows by the Pawnee in one of their wars. Here among a primitive race we thus find a form of symbolism which indicates considerable power of mental abstraction.

Swanton (11) reports, at length, on the Indians of the south central states. Unfortunately, most of his data are from secondhand sources, so obviously their value is correspondingly less. They are largely a collation of the reports of travellers and traders who visited this region in the early days.

In material culture the tribes, judging from these reports, were not far advanced, but there had developed among them a very strongly centralized form of social organization, and a fairly well organized mode of religious worship. The government consisted in a despotic control exercised by a centralized authority, known as the great chief, who ruled over the eight, or ten subsidiary chiefs of surrounding villages, and each such group formed an independent social unit. Now, in the central village of each group, there stood a temple for the worship of the great spirit, and within each temple an altar fire was kept constantly burning, a functionary being set apart whose exclusive business it was to keep the fire kindled and to see to it that it should never become extinguished. It is said that some of the villages did not have true temples, nevertheless the temple form of worship was a characteristic of the southern Indians. The temples were dedicated to the sun, and associated with worship in them was an elaborate ceremonial. Four or five days of fasting, at the least, and the use of emetics till the blood issued, was a necessary form of preparation; and a contrite submission and silent contemplation was the assumed attitude of the worshiper. To the temple the father always carried his first fruits. One passing the edifice, bearing a burden, must put it down and go through a form of exhortation to appease the spirit that dwelt within. Legend has it that the building of temples was commanded by a man and his wife who visited the people from the sun, and thus it is that all temples were dedicated to the sun spirit.

Belief in a kind of spiritism was universal with these people.

They peopled the universe with spirits, and the spirits formed a sort of hierarchy, with the sun at the head all-powerful and supreme. So far as is known, however, there was no belief in anything akin to a distinctly evil spirit.

With a social organization as complex as obtained among these Indians, it is not surprising to find evidences of a caste system. Social levels existed, based on an hierarchy of totemic clans. Property and individual rights were, however, generally respected. A medical function was also recognized, which, although not altogether free from magic, was far more highly specialized than among the Northern Indians. Polygamy extended to as many wives as a man could support. Wives were not held absolutely to faithfulness to their husbands and chastity among unmarried girls was said to be practically non-existent.

Freire-Marreco (6) has found evidences from a close study of the Mohave-Apache, of the Verde River, Arizona, which she believes controverts some teachings of many English anthropologists, to the effect that it is a fundamental characteristic of primitive mind to be mobbish. She discovered rather a loose, individualistic mode of life among these peoples, and this she throws into contrast with the strongly centralized and coherent social organization of some related tribes, the Pueblo of the Upper Rio Grande, New Mexico. Freire-Marreco is convinced that the determining factor in fixing the character of the social organization of a primitive people is not a natural mental bent, but rather the nature of the physical environment that encompasses them. Whether the obtaining of food, for example, is dependent on coöperative endeavor or the individual initiative of the members of the group; or whether, possibly, the nature of the environment is such as to compel or preclude coöperative effort, she holds, carries more weight in determining the mode of life of a people than their inherent mental make-up.

The Mohave-Apache are not so advanced in material culture as the Pueblo. They live in small camps, scattered here and there, two hundred, frequently, being spread out over an area of seven miles square. They have their subsistence by hunting and gathering wild fruit, and according to the Pueblo their manner of life is more like that of brutes than humans. In contrast the Pueblo are congregated into compact villages, two hundred being crowded together upon an acre of ground. They are agriculturists and carry on quite an extensive scheme of coöperative irrigation. A Pueblo spends his entire life in close proximity to the village of his birth, while the

Mohave-Apache wanders away hundreds of miles, as the presence or absence of food tempts him to move on. A corresponding difference is noted in the manner of internal organization. While the Mohave-Apache have no centralized form of control or machinery for coördinate effort, except a war chief who is without function save in war, the Pueblo village has a chief and council that exercise rather definite legislative and judicial control. Freire-Marreco takes as an illustration of the differences in practice of these forms of organization the annual spring festival dance, a ceremony of petition to the great spirit for a return of the vernal rains. Among the Mohave-Apache any one may start the dance and give it any direction that the impulse of the moment may dictate. The interest grows from day to day and other individuals and tribes join in from time to time, as they become possessed with the desire. With the Pueblo, on the other hand, it is radically different. This feast is definitely planned in advance, and the plans are submitted to the council for ratification. Not only is its character predetermined, but the date of its commencement and every detail of its procedure are thoroughly prearranged.

Here then are two forms of social organization strikingly different and it is held that the determining influence which has shaped them, respectively, is simply a matter of difference in general social morphology.

A form of social organization quite as loose as that of the Mohave-Apache obtained among the Eastern Cree and Northern Saulteau, reported by Skinner (10). Among these tribes each family formed a distinct social unit, which partook of the patriarchal character; the sole bond of coöperative unity appearing to lie in the family totem. Frequent changes in the location of camps, because of food scarcity, precluded the possibility of anything like a permanent village community. The families were ordinarily widely scattered, often as many as twenty miles intervening between any two, and under such circumstances, it is clear, even a rough coöperative system would necessarily break down.

Skinner offers extensive data regarding these tribes, their habits, material culture, and family and social customs. Polygamy formerly was common, and when a man married an older sister he usually took the younger ones also as they became old enough. Social purity among the unmarried was not held as a virtue, nor was fidelity of wife to husband considered a social necessity.

Animism and spiritism were highly developed, and there existed something in the nature of a spirit worship. At the proper age the

young man would repair to a place of seclusion in the forest, where, with fasting, and prayer to the great spirit, he awaited his vision, in which his future should be revealed to him, with its possibilities and limitations; and no one pretended to extend his activities beyond what his vision had vouchsafed. Conjury was practiced in the hunt, in love-making, in war, and to avenge a personal wrong. If one wished to harm an enemy, the spirit left its body, which then would be stretched out lifeless, whence it departed to injure or kill, by magic, whom it would. Animals, too, were believed to possess spirits as well as men, and their favor, it was thought, must be obtained if that species were to be taken by the hunter. Indeed, direct communication with the animal world was carried on by especially gifted individuals. To the bear, in particular, was attributed highly human powers, in that he was believed to understand any conversation that he might overhear. It is thus apparent that a very close kinship was felt with the animal creation.

There was some medical knowledge, but the physician must be one who was also highly skilled in magic. Idiots were believed to be possessed of evil spirits, so usually they were killed by burning at the stake, but no attention or treatment was accorded the insane.

On the Negro, only two scientific studies have been reported. Odum (9), in the one, has attempted to cover the entire field of the Negro's mental and social life, but, unfortunately, his data are only from observations and certain general interrogations. The present pressing need is for information regarding the Negro mind secured under carefully controlled conditions. Odum, however, reports to have experienced great difficulty in securing accurate data, for the reason that the Negro is naturally untrustworthy and secretive. It was seldom possible, he tells us, to get from an individual correct information regarding any important details. The negro is skillful in inventing plausible stories, and expanding upon minute details having no foundation in fact. To obtain acceptable data, it was necessary to make repeated inquiries from various sources and to check up results constantly. This fact, of course, is interestingly suggestive of the nature of the Negro's mental machinery.

Odum sums up the mental qualities of the Negro as: lacking in filial affection; with strong migratory instincts and tendencies; little sense of veneration, integrity or honor; shiftless, indolent, untidy, improvident, extravagant, lazy, untruthful, lacking in persistence and initiative, and unwilling to work continuously at details. Indeed, experience with the Negro in class rooms indicates that it is impossible

to get the child to do anything with continued accuracy, and similarly in industrial pursuits, the Negro shows a woeful lack of power of sustained activity and constructive conduct. Fear, sickness, and even stupidity are being constantly feigned to escape an unpleasant task. His mind works mechanically. He is fond of joining together euphonious words and phrases, with little regard to their meaning.

The Negro is said to love excitement. He is restless, bumptious, and sensuous. He will never work except when necessity compels. He has always been the subject of petty thieving, and Negroes often commit, unfeelingly, savage and ferocious crimes. His emotions are for the most part of the physiological type, with little objective control. Social purity, we are told, is unusual among girls who have reached adolescence, and infidelity among married women is not uncommon. Negroes possess little power to inhibit sensual feelings of any kind. They are gluttonous and drink liquors to excess. Anger of the epileptical, gesticulating, maniacal sort is easily excited, and a paralysis of fear sets in at the approach of death, at the presence of certain animals under peculiar conditions, and at unusual celestial occurrences; and an inherent terror of officers of the law is said to cause constant migrations.

Negroes are gregarious, but the social instincts of friendship, loyalty and emulation are little apparent. Other social instincts, however, they possess in a striking degree. They are proud, jealous, stubborn, assertive, covetous, egoistic. They are likewise reckless, assertive, impulsive, demonstrative, over-religious, fabalistic, and superstitious. Their crimes, Odum holds, are largely the expression of the animal instincts, which have been left to work themselves out unrestrained. On the other hand the Negro is imitative, adaptive and his protective instincts are strongly developed. While very primitive, therefore, in the majority of his traits, he possesses the possibilities of development under proper conditions of control.

The Negro child is characterized as psychophysical. He loves to sing, but cares little for instrumental music other than the banjo. He is fond of dancing and all types of motor activity of the grosser sort. He has a good memory, both auditory and visual, and up to the age of eleven or twelve his mind is bright and clear. In school the young child is alert, eager, attentive and interested, indeed, seems brighter than the white child of corresponding years, but with the oncoming of adolescence mental growth suffers arrest; the child becomes dull and stupid, and further development appears to be confined to the physical.

Odum speaks of Negroes as rather insensitive to pain. They go through surgical operations with relatively few fatalities and they convalesce rapidly. Negroes are immune to malaria, and yellow fever. Fibroid tumors among them are rare, and the sequellæ of syphilis and gonorrhea are much less pronounced than among whites. In connection with this relative immunity from disease, the report of Da Rocha's (4) 285 hospital cases of Negroes in an institution for the insane is interesting. He tells us that general paralysis, one of the sequellæ of syphilis, is extremely uncommon in the Negro race, in spite of the fact that a large proportion of both men and women have been afflicted with gonorrhea and syphilis at least once during their lives. Fixed delusions are rare, and epilepsy occurs very much less frequently than among whites. Senile dementia is found in about the same proportion, but Negroes are subject to the periodic insanities in greater frequency. It is interesting that among the Negro insane the women outnumber the men, whereas with whites just the reverse obtains. Da Rocha attributes this to the relatively greater stress of civilization which falls upon the Negro woman, rather than upon the man as in the dominant race, since upon her falls the burden of the family support. Negro women, also, were found to be more addicted to drunkenness than the men. Women are thus more exposed to the exigencies of social life; they succumb in larger numbers to its temptations, and break mentally more frequently than do the men.

REFERENCES

1. BOAS, FRANZ. *Handbook of American Indian Languages*. (Smithsonian Instit. Bureau of Amer. Ethnol. Bull. 40.) Washington: Gov. Printing Office, 1911. Pp. vi+1069.
2. BUSHNELL, DAVID J. JR. *The Choctow of Bayou Lacombe*. (Smithsonian Instit. Bureau of Amer. Ethnol. Bull. 48.) Washington: Gov. Printing Office, 1909. Pp. 37.
3. BUSHNELL, DAVID J. JR. Myths of the Louisiana Choctow. *Amer. Anthropol.*, 1910, 12, 526-535.
4. DA ROCHA, F. Contribution à l'étude de la folie dans la race noire. *Ann. méd.-psychol.*, 1911, 14, 337-382.
5. EASTMAN, C. A. *The Soul of the Indian*. Boston: Houghton Mifflin Co., 1911. Pp. xiii+171.
6. FREIRE-MARRECO, BARBARA. Two American Indian Dances. *Sociol. Rev.*, 1911, 4, 324-337.
7. GRINNELL, G. B. Some Early Cheyenne Tales. *Folk-lore*, 1907, 20, 169-194; 1908, 21, 3-54.
8. GRINNELL, G. B. The Great Mysteries of the Cheyenne. *Amer. Anthropol.*, 1910, 12, 542-575.
9. ODUM, H. W. *Mental and Social Traits of the Negro*. New York: Columbia Uni. Contrib. to Econom., 1910. Pp. 300.

10. SKINNER, ALANSON. *The Eastern Cree and the Northern Saulteau*. New York: Anthropol. Papers. Amer. Museum Nat. Hist., 1911, 9 (Pt. I.). Pp. 177.
11. SWANTON, J. R. *Indian Tribes of the Lower Mississippi*. (Smithsonian Instit. Bureau of Amer. Ethnol. Bull. 51.) Washington: Gov. Printing Office, 1911. Pp. 387.

INDIVIDUAL AND GROUP EFFICIENCY

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In the following pages it is my purpose to review briefly the efficiency literature which has appeared during the last two years, and which admits of summary under the following heads.

I. *The Conservation and Increase of Vocational (Industrial-Commercial) Efficiency*, by means of scientific shop or business management.

In two lucidly written and aptly illustrated volumes, Emerson has presented the ablest exposition extant of the philosophy of efficient industrial management (9), together with a codification of the practical scientific principles involved (10). He recognizes that efficient shop management—which depends on the establishment of scientific analytical motion and times studies, of time equivalents for every operation or task, and the adoption of a standard service or labor equivalent for a given wage—cannot be instituted without a staff of consulting experts, consisting not merely of efficiency engineers and wage specialists, but also of “character analysts,” psychologists, hygienists, physiologists, bacteriologists and economists. While absolute standards for chemical, physical and electrical processes can readily be set and enforced, human beings must be rated, classified and treated as sentient, moral beings. Properly to administer men on efficiency principles requires the expert services of the psychologist, physiologist, physician and humanitarian. Indeed Emerson avers that, so far from being a purely engineering problem, the highest staff standards are psychological. “It is psychology, not soil or climate, that enables a man to raise five times as many potatoes per acre as the average of his own state” (9, p. 107). Moreover, the science of industrial efficiency is an idealistic philosophy, and not merely a cold, brutal, calculating scheme for oppressing labor—a fact which has been emphasized by Brandeis (3), who argues that there is no inherent incompatibility between the claims of scientific management and the rights of organized labor. Scientific management means the “square deal” for the wage-worker; shorter hours, without “speeding up”;

more regular employment and greater security of tenure; proportionately higher financial returns; instruction for the inefficient; and a heightened feeling of self-respect and interest in the work.

That the problem is in part both psychological and pedagogical is likewise emphasized by Gantt (the author of the "bonus system" of compensation, which provides extra pay for work satisfactorily done in a specified time: piece work for the skilled and day work for the unskilled). He (11) recognizes the need of a factory pedagogue, who must be a keen analyst as well as an efficient teacher. His duties will consist in instructing the workmen, in training them to form efficient vocational habits, and to acquire habits of industry and willing coöperation. The policy of the past was to drive or force the wage worker: in the future it must be to teach and lead. The whip must be replaced by stimuli derived from skilled instruction, merited promotion, and a deserved bonus.

That the new science of industrial efficiency cannot justify itself solely by its economic fruits, but must also be judged by its ultimate physiological and social effects upon the workers, is emphasized by Goldmark (12a), in an able and comprehensive digest of the literature bearing on "Fatigue and Efficiency" in industry. (The best psychological researches, unfortunately, receive no mention in this voluminous compilation). Owing to the strong tendency to exploit the workers which will exist under any kind of management, the interests of racial efficiency need to be protected by adequate labor legislation. Such legislation must, in the first instance, be based on scientific studies of fatigue. Scientific shop management will have to conform to the physiological laws (and psychological, forsooth) underlying the industrial life.

The psychological and pedagogical principles which may be utilized to increase business efficiency receive their most explicit formulation by the psychologist. Scott (19) considers that human efficiency is not solely dependent on inherent capacity, but on a number of mental factors which it is possible intelligently to utilize by becoming familiar with the principles of business and educational psychology. Scott discusses a number of psychological principles which can be practically applied to increase business efficiency, such as imitation, competition, loyalty, concentration, wages, pleasure, habit-formation and relaxation.¹

2. *The Conservation and Increase of the Efficiency of Eminent Talent*, by the scientific, impersonal, objective study and control of

¹ See special review in a forthcoming number of the BULLETIN.

the conditioning factors of scientific, literary and artistic eminence, fame or genius.

After a lapse of seven years Cattell (5) has repeated his statistical group study of the most eminent American men of science. He has undertaken a painstaking analysis of the changes which have taken place during these years, in the relative rank, and in the sectional, state, city, institutional, professional, sex and age distribution of scientific workers throughout the country. Among the more important furthering environmental factors are geographical location or institutional affiliation, and professional position (career). Massachusetts and Connecticut continue to maintain their scientific pre-eminence, while three-fourths of the leading scientists are in the teaching profession—only three medical men not teaching in medical schools find positions in the distribution.

Cattell's explanation of the fact that only 18 of our 1,000 leading scientists are women, as due to an "innate sexual disqualification," is rejected by Hayes (13) and Talbot (22), who find the cause in woman's social and educational inequalities and handicaps.

Woodworth (32) finds six or seven factors responsible for the fact that the average American standard of scientific productivity is below the European level, of which the most important is our rapid national, industrial, economic and educational expansion. The fields of industrial, economic and educational promotion, organization and administration offer higher financial and social rewards, and have thereby attracted our best minds.

But the fact that Massachusetts and Connecticut have produced far more eminent men in proportion to the general population than Virginia, North Carolina or South Carolina cannot be accounted for, according to Johnson (15), on Wood's hypothesis of the dominance of heredity over environment. It is due, as shown by the financial school budgets of these states, to the greater expenditure of money for educational purposes in New England than in the Southern states.

On the other hand, the Whethams (29), from an historiometric study by the space method of one fifth of consecutive names in the British Dictionary of National Biography, reach the conclusion: that able parents have able children, provided "like-to-like" matings occur, as is found to be the case among the English administrative and peerage classes. The comparative inferiority of the progeny of artistic, literary or scientific men is due to the fact that these classes of men form chance alliances: they do not mate with their

likes. The "like-to-like" matings thus subserve an important evolutionary function: they create a super-class in the general population.

In this connection note may be made of Stern's recommendation (20) for the conservation of incipient talent, that special-talent classes and a special pedagogy should be provided for super-normal children; and of Kiernan's contention (17), that the genius is a child potentially developed, biologically and psychologically, that he must be provided with a favorable environment, particularly during the psychological stress periods, and that his potentialities must be aided by all-round development and not by one-sided stimulation, which will tend to upset the instable bio-psychological mechanism.

One sympathizes with the facts, which are emphasized and deplored in current discussions of the super-child or super-adult, that we lack at present any satisfactory standard of genius (the Whethams, 29), that misconceptions of precocity are widespread (O'Shea, 18), and that the necessity has not always been recognized of clearly distinguishing between merit and fame in historiometric discussions (Browne, 4). Wood's claim (31) that historiometry (the objective statistical treatment and relative grading of the fame of historical characters) can be reduced to an exact science is denied by Browne (4), because this would-be science does not possess any historiometric functions of constant value. This is particularly true of the adjective method (the ratio of the number of adjectives of praise to dispraise), which does not give a constant differential value to adjectives of different qualitative importance. Browne considers the adjective method inferior to the space and reference-frequency methods.

3. *The Conservation and Increase of Racial Efficiency*, through eugenical matings, and the elimination of the unfit by sterilization or segregation.

Among the significant studies of the hereditary factors involved in dependency, defectiveness and delinquency are the family history investigations of Davenport (7) and Goddard (12). Davenport voices his disapproval in no uncertain terms ("Oh, fie, on legislators who spend thousands of dollars on drastic action and refuse a dollar for an inquiry as to the desirability of such action!") of the legislative efforts to eliminate the unfit by the enactment of compulsory sterilization or anti-procreation laws. He favors the milder remedy suggested by segregation.

Notice should be taken of an attempt to standardize the methods of collecting, charting and analyzing hereditary data (8).

4. *The Conservation and Increase of the Mental Efficiency of Indi-*

viduals, by means of the removal of physical defects (*orthophrenics through orthosomatics*),¹ or by the administration of proper pharmacological or dietetico-dynamic agents.

Wallin has measured by serial psychological tests given throughout a school year the euthenical effects of oral treatment and prophylaxis on the working efficiency of school children—a control squad of 27 pupils (26). The contention is made “that the desirability of establishing dental clinics in the public schools for free inspection and treatment should present itself to the taxpayer as a simple business, if not a humanitarian, proposition—the paying of proper dividends on the capital invested in the schools,” the elimination of preventable waste.

The elaborate series of psychological measurements of Hollingworth (14) of the influence of caffeine on various mental and motor processes and on the sleep and general health of a control squad of 16 male and female adults will serve as a model for similar scientific investigations in the future of the somato-euphoric and psycho-orthogenic effects of the use of various drugs, foods, dietaries, etc. His results indicate that mental efficiency may be heightened, without reactionary after effects, by the administration of judicious doses of caffeine in its pure form.

Closely related is 5. *The Conservation and Increase of the Working Efficiency of the School Population*, of normal or abnormal pupils, in elementary, higher, special, rural, urban or state institutions, by the scientific study and control of the processes and agencies which directly or indirectly minister to psycho-pedagogical proficiency.

Perhaps we may agree with the eugenicist that permanent racial improvement will come only by improving the inborn qualities of men (considered under 3, above). At the same time, we are obliged to deal with conditions as we find them; after the human misfits have been born, we must bring them to maximal efficiency by improving the environmental factors. The most important euthenical agencies are the schools and the training or corrective institutions. And it is gratifying to observe that in no field of modern enterprise is the

¹ I would suggest the use of the word *orthophrenic* to designate any process or regimen by means of which deviate mentality may be made to function aright; the word *orthosomatic*, to designate any process or regimen by means of which any malfunctioning bodily organ may be made to work normally; and the word *orthogenic*, as the generic term to apply to any orthophrenic or orthosomatic processes of restoring deviate human nature to normal functioning. All these processes are essentially and specifically pedagogico- or medico-corrective. Effectually to apply them presupposes the development of a number of highly technical orthogenic sciences.

efficiency problem receiving greater scientific study than in the realm of education. Here the major studies have been concerned with the attempt to determine more accurately than was formerly the case the current rate of progress through the grades (thus Blan, 2; Keyes, 16; Strayer, 21); with the introduction of effective schemes of varying the rate of progress through the grades, so that the needs of the individual pupil may be properly conserved (thus, *e. g.*, the Mannheim system of grade organization; Van Sickle, 25); with the attempt to differentiate curricula, so as to render them sufficiently varied to meet the needs of all types of exceptional children (witness the recent organization of special classes, occupational courses, elementary industrial, trade and continuation schools); with the effort to establish by diagnostic, psychological tests, developmental age-scales of personal, social, industrial, motor and intellectual traits for retarded, average and accelerated pupils, so that pedagogical or vocational tasks may be fitly adjusted to the level of functioning of each child (thus Wallin's plan for gauging the efficiencies of a colony of epileptics, 27); with the task of establishing pedagogical efficiency scores, criteria or scales, by which to make an impersonal, objective determination of a child's proficiency in various branches of the curriculum, such as English composition (Thorndike, 23), handwriting (Thorndike, 24; Ayres, 1); and the fundamental operations in arithmetic (Courtis, 6); with the effort to determine the functional efficiency of various methods of teaching, such as the incidental or drill method of teaching spelling (Wallin, 28, who fails to substantiate the claims of Rice and Cornman, and who shows by tests that spelling efficiency can be increased by the utilization of a psychologically justifiable drill technique); and with the attempt to determine the best age at which to enter children in the schools (Winch, 30, who finds that there is no intellectual advantage in entering children at three rather than at five in English schools).

This survey of the literature on human efficiency—necessarily all too brief relatively to the importance of the subject—should leave a three-fold impression in the mind of the reader: first, that the problem of conserving and increasing the efficiency of the race is many-sided, presenting many varied and complex phases; second, that the problem is soluble only through the development and application of a distinct scientific technique, sufficiently varied and specialized to fit any phase of the problem; and, third, that the problem is too large to be solved by any one type or class of existing investigator, but that it requires the development of a new type of scientific investiga-

tors, namely, a coöperative corps of "efficiency experts" in physiology, psychology, education, hygiene, medicine, anthropology, sociology, philanthropy, economy, chemistry, engineering and jurisprudence.

1. AYRES, L. P. *A Scale for Measuring the Quality of Handwriting of School Children*. New York: Department of Child Hygiene, Russell Sage Foundation, 1912.
2. BLAN, L. B. *A Special Study of the Incidence of Retardation*. New York: Teachers College, Columbia University, 1911. Pp. 111.
3. BRANDEIS, LOUIS D. Organized Labor and Efficiency. *The Survey*, 1911, 26, 148-151.
4. BROWNE, C. A. The Comparative Value of Methods of Estimating Fame. *Science*, 1911, 33, 770-773.
5. CATTELL, J. McK. A Further Statistical Study of American Men of Science. In *American Men of Science*. New York, 2d ed., 1910, 564-596.
6. COURTIS, S. A. Standard Scores in Arithmetic. *The Elementary School Teacher*, 1911, 12, 127-137.
7. DAVENPORT, C. B. *Heredity in Relation to Eugenics*. New York: Henry Holt and Co., 1911. Pp. 298.
8. DAVENPORT, C. B., ET AL. *The Study of Human Heredity*. Cold Spring Harbor: Eugenics Record Office, Bulletin No. 2. Pp. 17.
9. EMERSON, H. *Efficiency as a Basis for Operation and Wages*. New York: The Engineering Magazine, 1912. Pp. 254.
10. EMERSON, H. *The Twelve Principles of Efficiency*. New York: The Engineering Magazine, 1912. Pp. 423.
11. GANTT, H. L. *Work, Wages, and Profits*. New York: The Engineering Magazine, 1911. Pp. 194.
12. GODDARD, H. H. Heredity of Feeble-Mindedness. *American Breeders Magazine*, 1910, 1, 165-178.
- 12a. GOLDMARK, JOSEPHINE. *Fatigue and Efficiency, a Study in Industry*. New York: Charities Publication Committee, 1912. Part I., pp. 288. Part II., pp. 565. (Briefs in defense of women's labor laws by Louis D. Brandeis and Josephine Goldmark.)
13. HAYES, ELLEN. Women and Scientific Research. *Science*, 1910, 32, 864-866.
14. HOLLINGWORTH, H. L. *The Influence of Caffein on Mental and Motor Efficiency*. New York: Archives of Psychology, No. 22, 1912. Pp. 166.
15. JOHNSON, G. H. Dr. Wood's Application of the Historiometric Method. *Science*, 1911, 33, 773-775.
16. KEYES, C. H. *Progress through the Grades of City Schools*. New York: Teachers College, Columbia University, 1911. Pp. 79.
17. KIERNAN, J. G. Is Genius a Sport, a Neurosis, or a Child Potentially Developed? *The Alienist and Neurologist*, serial articles from May, 1907, to February, 1912.
18. O'SHEA, M. V. Popular Misconceptions Concerning Precocity in Children. *Science*, 1911, 34, 666-674.
19. SCOTT, W. D. *Increasing Human Efficiency in Business*. New York: The Macmillan Co., 1912. Pp. 339.
20. STERN, W. The Supernormal Child. *J. of Educ. Psychol.*, 1911, 2, 143-148; 181-190.
21. STRAYER, G. D. *Age and Grade Census of Schools and Colleges*. Washington: Bulletin No. 451, U. S. Bureau of Education, 1911. Pp. 144.

22. TALBOT, MARION. Women and Scientific Research. *Science*, 1910, 32, 866.
23. THORNDIKE, E. L. A Scale of Merit in English Writing by Young People. *J. of Educ. Psychol.*, 1911, 2, 361-368.
24. THORNDIKE, E. L. Handwriting. New York: Teachers College Record, 1910. Pp. 93.
25. VAN SICKLE, J., ET AL. *Provision for Exceptional Children in Public Schools*. Washington: Bulletin 461, U. S. Bureau of Education, 1911. Pp. 92.
26. WALLIN, J. E. W. Experimental Oral Euthenics. *Dental Cosmos*, 1912, 54, 404-413; 545-566. Also, Experimental Oral Orthogenics. *J. of Phil., Psychol., etc.*, 1912, 9, 290-298.
27. WALLIN, J. E. W. Human Efficiency, a Plan for the Observational, Clinical and Experimental Study of the Personal, Social, Industrial, School and Intellectual Efficiencies of Normal and Abnormal Individuals. *Ped. Sem.*, 1911, 18, 74-84. See also Eight Months of Psycho-Clinical Research at the New Jersey State Village for Epileptics, with Some Results from the Binet-Simon Testing. *Transactions of the National Association for the Study of Epilepsy and the Care and Treatment of Epileptics*, 1912, 8, 29-43. (Reprinted in *Epilepsia*, 1912.)
28. WALLIN, J. E. W. *Spelling Efficiency, in Relation to Age, Grade and Sex, and the Question of Transfer*. Baltimore: Warwick and York, 1911. Pp. 91. Also, How to Increase Spelling Efficiency. *Atlantic Educational Journal*, 1912, 7, 225-226.
29. WHETHAM, W. C. D. & C. D. Eminence and Heredity. *The Nineteenth Century*, 1911, 69, 818-832.
30. WINCH, W. H. *When Should a Child Begin School?* Baltimore: Warwick & York, 1911. Pp. 98.
31. WOODS, F. A. Historiometry as an Exact Science. *Science*, 1911, 33, 568-574.
32. WOODWORTH, R. S. On Factors Contributing to a Low Scientific Productivity in America. *Science*, 1911, 33, 374-379.

NATIONAL PSYCHOLOGY

BY R. S. WOODWORTH

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National psychology, as popularly written, suffers from a variety of defects. Its aim should be, evidently, first to determine the facts of national behavior, and then to seek an explanation of these facts in the national environment and heredity, and in the social transmission to later generations of what has been acquired in the history and experience of the nation. To work back from the behavior of a nation to its native traits is no easy task, and to infer a difference in national temperament or mentality from a difference in the behavior of two nations is illegitimate unless the past experience and training of the two nations are evaluated. It is a common defect of national, or international psychology to ignore this difficulty and to jump at

once from differences in behavior to differences in national traits. No less a defect appears in the description of national behavior; for those who compare nations seem to have an irresistible tendency to seek for contrasts, which leads them to hasty generalizations as to the facts of behavior. The great individual differences which exist within any nation are neglected, and the nation is spoken of as if all its members behaved in the same way; and, further, no note is taken of the inconsistencies that appear in a nation's behavior when examined in different particulars. The whole subject, whether in respect to the facts or in respect to their interpretation, is in a most unscientific and unsatisfactory state.

The two books here noticed are not worse than others on national psychology. That of Low (1) is rather to be called unusually good. It is a fair-minded attempt to understand the character of the American people as revealed in their political and economic behavior, and follows their history from the settlement of the country to the present. The author's main contention is that the American character is essentially British, modified by the conditions of life in the new country but not by the non-British elements of the population. These last have been assimilated by a process which is sketched as follows. At any given time, the newly arrived immigrants find places near the bottom of the economic scale, so that the contrast between native Americans and foreigners is equivalent to a contrast between higher and lower social classes, and the effort to rise in the social scale resolves itself into an effort to become Americanized. A sort of polarity pervades the population, and every one strives away from the foreign pole and towards the native pole. The older stock does not take on the ways of the newer arrivals, but these take on the ways of the older stock to such an extent as to become indistinguishable from it in the second or third generation.

Meanwhile, however, the national character does not remain unchanged, but responds to changing conditions by the development of new traits which are transmitted from father to son and outlive the special conditions that gave rise to them. The American's "disrespect for law"—a generalization which, by the way, needs to be tested by a much broader examination of the facts than the author attempts—was a natural response to the conditions of pioneer life combined with the absence of a governing class; but, originating in this way as a reaction to the environment, it was so bred into the bone as to become a hereditary trait. Here, it will be seen, the author is on shaky biological ground; and, in fact, he nowhere shows

a sense for the biological side of his theme. But his book is valuable for its social analysis, and for its study of the mental and moral traits that have been prominent in American history.

André (2) is concerned with the mental and moral traits of the Spanish people. He raises the question, why Spain lags behind in the march of modern progress, and seeks his answer in an imperfect adaptation to modern requirements of the Spanish character and ideals of life. According to him, the Spanish people are lacking in industry, energy, initiative and scientific curiosity, and have not caught the spirit of work which is the life of the progressive industrial nations. How far this lack of energy and industry is inherent in the national heredity, how far it is due to climate, how far to poverty and insufficient nutrition, and how far to custom and traditional ideals, the author does not seriously set himself to decide, though he mentions all of these factors and lays stress on the last two. The book is a jeremiad preached by the author to his countrymen, and certainly exaggerates the differences between the Spanish and other peoples. It forcibly calls attention to an interesting problem in national psychology, without contributing much of scientific value either in the way of facts or in their analysis. It abounds, however, in interesting ethical discussions.

REFERENCES

1. LOW, A. MAURICE. *The American People*. Boston and New York: Houghton Mifflin Co. Vol. II., 1911. Pp. 608. \$2.25 net.
2. ANDRÉ, ELOY LUIS. *Ética española*. Madrid: M. G. Hernandez, 1910. Pp. 304.

SPECIAL REVIEWS

THE STUDY OF PRIMITIVE RACES

Vorschläge zur psychologischen Untersuchung primitiver Menschen.

Beiheft zur *Zsch. f. angew. Psychol. u. psychol. Sammelforsch.* 1
Theil. Leipzig, 1912. Pp. 124.

These "Vorschläge" form the first of a series of contributions on the psychological study of primitive man. It is intended to provide instructions in simple tests for all those, such as missionaries, teachers of native schools, officials, doctors and the like, who come into contact with men in primitive stages of culture. The preface suggests that all users of the study and others interested ally themselves with the *Institut für Angewandte Psychologie*, which will furnish descriptions and illustrations of the tests, preserve the data acquired and offer the *Zeitschrift* as the organ for the publication of the results.

The work consists of a series of 11 reports by four men on special topics, with an introduction and supplement by a fifth, making a total of 124 pages.

Twenty-seven pages are given to the Introduction by Thurnwald, in which he discusses the problems of ethnopsychological investigation. The study of man involves not only his physical side but also his mental side and his relations to his environment, both natural and social. These separate aspects of men are so interwoven that no one of the problems can be solved independently of the others. In the past the psychological aspect has been the most neglected. In the questionnaires in which psychological questions have appeared, the answers have been of little value on account of the vagueness of the questions and the lack of skilled investigators.

The infinitely manifold phenomena of social and cultural life are merely the varying effect of different arrangements of relatively few simple elements, factors and conditions. The working of these elements in the social process, which is mediated through the psychic factors, is a constant. It is necessary first to seek out these elements and study them rather than the complex structures which they form,—this is the duty of the ethno-psychologist. For this purpose the study of certain individuals of a group is of more value than a study of the general culture of a community. If one wishes to get an

average value for some quality of a group, he may observe a few typical cases from that group, keeping in mind the fact of individual differences and the difficulty of isolating the subject for experimental purposes. Since today there are no ethno-psychological norms, these must be built up from just such tests as the present collection represents. When such norms are established, the further investigation in this field will be comparatively simple.

Thurnwald points out the following sources of error which the use of tests on primitive peoples involves: (1) The influence of the experimenter will be a big factor, especially where the problems are put into the hands of untrained observers. Such a one must have not only a knowledge of experimental methods but he must be endowed with infinite patience to perform preliminary experiments, in order that the test may be rightly understood. (2) Exact work will be impossible where the laboratory is a clearing in the forest or perhaps a native's hut. (3) There will be an almost complete lack of apparatus on account of the difficulty of transportation, weather conditions, lack of electricity, etc. (4) The greatest difficulty will be the lack of comprehension both of the general attitude toward the experiment and of the means of expression. The use of an interpreter will be of doubtful value, so that the tests must be so constructed as to demand the smallest possible amount of speech.

The ultimate aim of the tests is to show not merely differences between the primitive peoples and ourselves, but to draw distinctions among the primitive social groups, which shall be of practical value to all who are brought into political or economic relations with them.

The *optical space sense* is discussed by Tschermak in 13 pages. No great differences are to be expected in this field, which is based on relatively simple processes, and which, so far as we can judge, is the same in the higher animals. An accurate study of this sense would require considerable apparatus, but certain tests have been selected which require very little more than objects of nature. These are tests to determine the knowledge of the directions of space, accuracy of the judgment of the vertical and horizontal directions, visual acuity, visual illusions, binocular vision, using the simple stereoscope and various tests for detecting squint.

Guttmann, who contributes the report on the *color sense* in 12 pages, considers this the most difficult sense for the ordinary individual to test. It presupposes a knowledge of one's own color sense, of the various forms of color-blindness with their symptoms, that is,

total color-blindness, partial color-blindness, color weakness and the various transition forms. It presupposes a knowledge of the diagnostic methods and control of the technique of these methods. The lack of color terminology in the natives makes judgments of colored yarns or papers impossible, except the judgment of likeness and difference. For the various tests on color vision, Guttman recommends Nagel's diagnostic tables, on account of their simplicity and cheapness. By these tests one can determine the frequency of color-blindness and of the different forms of color-blindness compared with the cultured races. Among primitive peoples there should be a good opportunity for the study of heredity of the defects of color vision. All visual disturbances should be a large social factor among people with whom almost every vocation depends on the sense of vision and where no corrective means are at hand.

Lipmann on *memory and comprehension* considers the function of the memory tests not to determine general laws of memory which have been worked out under more favorable circumstances, but to make tests that shall show the absolute amount of material retained by different races or groups under similar conditions. He considers it more practicable to give one test only of each kind to each individual, and to compensate for this by testing a large number of individuals. This plan must be adopted on account of the scarcity of available material, and on account of the effect of practice, when the same material is used. The series of tests consists of memory for simple tones, colors and weights, and tests to determine the types of memory. In the tests for associative memory nonsense syllables are replaced by form-color, German and native words, and simple words and objects. The material for all of the tests is obtainable from the *Institut*.

The tests on *suggestion*, also by Lipmann, are introduced by a series of questions to be answered by the investigator concerning the part played by suggestion in the daily life of the people. Then follow a number of simple tests under the heads of suggestion of perception, of memory, hypnotic suggestion, auto-suggestion, and the various combinations of these forms.

The study of the *time sense* by Vierkandt and Stern consists of 17 series of questions relating to the method of telling the time of day, the method of recording the time in the past, the application of time measurement to practical purposes, how closely small intervals of time can be judged, etc. A few simple experiments with the metronome are suggested.

Vierkandt contributes a series of 12 questions on *counting*, as to the methods of counting, the existence of collective words like dozen, score, and the like, and the knowledge of the number of ordinary objects such as the fingers, teeth, etc. All of the questions must be answered from the general observation of the student.

Stern and Meinhof report on *expressive movements and speech*. Concerning the former the aim is to discover whether expressive movements are constant for the same emotional state and whether these movements correspond to those of cultured races. The questions on speech relate to the presence of the different grammatical forms such as adverbs, interjections, etc., and of forms of speech peculiar to certain classes of people, as workmen, or priests. All are questions to be answered from general observation.

The next four sections, all of them of the questionnaire type, are by Vierkandt. The section on *drawing and art* gives instructions for studying the drawings common to the natives and for obtaining drawings from simple models. Attention is given to their knowledge of perspective, angles and position of objects. This section also contains a series of questions on the native songs, dances and stories. The section on *convictions and manner of thought* considers the nature of the native interest in things, whether it be of a theoretical or practical sort, their tendency toward lying and whether it be unconscious or toward definite ends, the nature of their belief in myths, spirits, etc. The *sociology* of the native to which 12 pages are given makes up the tenth section. It consists almost entirely of questions concerning the leaders of groups, social stratification, the life and training of the children, and their relation to their parents and to each other. There are two groups of questions on forms of play, ten on family and altruistic relations, several on moral ideals and conditions of immorality. Then there is a long series of questions on the variation in customs, their source, the influence of neighboring and foreign peoples upon the native customs. Section II deals with the *native philosophy*, the ideas of the nature of matter, of death, immortality, their explanation of disease, etc.

In a supplement Thurnwald points out further the difficulties attendant upon the use of the preceding tests. Probably the greatest difficulty is that of the language, the fact that the greater part of the information must be obtained from conversation with the natives. This difficulty can be overcome only by years spent among the people. Success or failure depends on the investigator; the outlines given can only point out the way and suggest the line of study, and the value

of the data obtained will be in proportion to the ingenuity and originality of the student.

This *Beiheft* contains neither a short cut through the difficulties of ethno-psychological investigations nor an escape from them. But by very simple experiments and by short, explicit questions it aims to have the material take some definite form. Only in this way can the questionnaire method produce a mass of data which can be presented in a statistical form for comparative study. For this one reason alone the monograph should be welcomed by all those interested in a scientific study of social problems among primitive people.

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THE MIND OF PRIMITIVE MAN

The Mind of Primitive Man. FRANZ BOAS. New York: The Macmillan Co., 1911. Pp. x + 294.

This book contains the lectures delivered by the author before the Lowell Institute and the National University of Mexico, 1910-1911. It is not often that so small a book represents so much maturity of scholarship and so extended research. The lectures were a revision and enlargement of some articles published in various journals at different times. There are altogether ten chapters, one being a short summary of the first eight. The book is peculiarly destructive to popular and scientific theories about primitive people. In fact it may be said right at the beginning that according to the author there is no primitive mind; there is just mind and that is the same in all essentials wherever it is found in the genus *homo*. The outcome of the book is something quite different, however, from destructive criticism. While it shows the untenableness of most current views of primitive and savage peoples and so clears the field, it is most constructive in showing how trustworthy results may be won and where the field lies that needs most working. The book marks the close of the period in the science of anthropology for hasty generalization, and unwarranted speculation. The spirit of optimism and of respect for all human quality is its dominating note; it tends on every page to wholesome-mindedness.

Under racial prejudice the assumption that achievement by a race is evidence of aptitude is examined and rejected. Emphasis is laid (p. 7) upon the carrying of ideas and inventions from one race to another. It is not greater national endowment but better chance

that accounts for achievement. The period of cultural history is very short in comparison with the history of the race (p. 9). Ease of diffusion explains the rapid rise in Europe (p. 13). He holds that "the variations in cultural development can as well be explained by a consideration of the general course of historical events without recourse to the theory of material differences of mental faculty in different races."

In the chapter on influence of environment the problems set are: "the distinctions between races" and "distinctions between the social strata of the same race." Given traits appear more frequently among some races than among others; the "varieties that constitute each race overlap." This overlapping is greater with some traits than with others, and some traits do not extend to all races. The author favors the influence of environment rather than that of selection, pointing to his and Bowditch's work in comparing the children born in America with their European relatives. This is restricted by the "assumption of a strictly limited plasticity." The factors that impinge upon this plasticity are "change of nutrition and mode of life," "conscious selection," and "crossing." The study here turns upon domesticated animals.

"Articulate language, the use of implements and the power of reasoning belong to all members of the human species as opposed to the higher animals." "Hereditary mental faculty was not improved by civilization." Between primitive and civilized man there is the difference only of frequency of occurrence for given traits. The power to inhibit impulses, to give attention and to reason clearly come out upon different occasions, but all types have them. The present types of race are older than languages and each type has doubtless produced many languages. There are common classifications and formal elements in all languages. The development of language is dependent upon thought, not thought upon language—a conclusion by no means well supported.

Under the universality of cultural traits, it is said, "We may therefore base our further considerations on the theory of the similarity of mental functions in all races," and "much more detailed similarities in thought and action occur among the most diverse peoples." Four current views are offered: first, similarities appear in similar types of environment; second, common customs and beliefs are "an old heritage derived from the earliest times"; third, some have tried "to isolate the most generalized forms of similar ethnic phenomena"; and fourth, similarities are to be explained by "analysis

of mental processes." Under the first is allowed that analogues of culture are found among a vast variety of peoples. But customs prevail (p. 159) outside of suitable environments where they may work injury. Parallel and independent cultures may have arisen. Inner growth of a race and dispersion of culture both need consideration. "And we may infer that the simpler the observed fact, the more likely it is that it may have developed from one source here, from another there" (p. 192). In regard to the evolutionary point of view, "serious objection may be made against the assumption of the occurrence of a general sequence of cultural stages"; "we recognize a peculiar tendency of diverse customs and beliefs to converge towards similar forms." Development is not from simple to complex, but rather is there an intercrossing of two opposite tendencies—one, from the simple to complex, and the other from the complex to the simple.

Some traits of primitive culture are, (1) conditions of objects are often considered as independent realities; (2) classifications in language never rise into consciousness, while others do; (3) object and attribute are treated differently; (4) power of will and motion are identified as one; (5) the wide inclusion of blood relationships in the incest group; and (6) the perceptions of the senses are excellent and the power of logical interpretation is deficient. This difference the author regards as due to the traditional ideas current in the race and not to deficiency in mental endowment. The difference between primitive and civilized man lies in the character of the traditional material with which new perceptions are assimilated. An understanding of the myths is the keynote of primitive society. This accords with the general tenor of the book, that it is tradition and not morphological character that differentiates races and the primitive man from the cultured. "Any one familiar with primitive life will know that the children are constantly exhorted to follow the example of their elders, and every collection of carefully recorded traditions contains numerous references to advice given by parents to children, impressing them with the duty to observe the customs of the tribe" (p. 240). Here the direct influence of education points in the same way as the general treatment of the book, that the differences among men are chiefly due to environment as hindering or aiding in the spread of culture, that these differences do not extend below the level of custom and belief, and that customs and beliefs have no considerable selective power upon the races of men. The chapter at the close upon the race problems in America carries out the argument

of the book. America presents no entirely new situations and its problems are being met in much the same way as race mixtures have been met in the past. Prejudice is not going to hinder permanently the amalgamation of the races and there is no good reason for regarding the negro as inferior. Genius is only a more rare occurrence in this race than in his white neighbor. His closing sentence deserves emphasis: "We should learn to look upon foreign races with greater sympathy, and with the conviction, that, as all races have contributed to the past cultural progress in one way or another, so they are capable of advancing the interests of mankind, if we are only willing to give them a fair opportunity."

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BOOKS RECEIVED DURING SEPTEMBER

GODDARD, H. H. *The Kallikak Family*. New York: Macmillan Co., 1912. Pp. xv + 121. \$1.50 net.

HRDLIČKA, A. *Early Man in South America* (Bureau of American Ethnology, Bulletin 52). Washington: Gov. Printing Office, 1912. Pp. xv + 405.

KEMMERICH, M. *Prophezeiungen: alter Aberglaube oder neue Wahrheit?* Munich: A. Langen, 1911. Pp. 435.

HACK, V. *Das Wesen der Religion nach A. Ritschl und A. E. Biedermann*. Leipzig: Quelle und Meyer, 1911. Pp. 56.

JONES, E. *Der Alptraum in seiner Beziehung zu gewissen Formen des mittelalterlichen Aberglaubens*. (Deutsch von E. H. Sachs.) Leipzig und Wien: Franz Deuticke, 1912. Pp. 140. M. 5.

NOTES AND NEWS

DR. MADISON BENTLEY, assistant professor of psychology in Cornell University, has accepted a professorship of psychology at the University of Illinois.

DR. H. P. WELD, of Clark University, has been called to an assistant professorship of psychology at Cornell University.

DR. GEORGE F. ARPS has been called from the position of assistant professor of psychology at the University of Illinois to a professorship of psychology at Ohio State University.

DR. W. F. BOOK, professor of psychology and philosophy at the

State University of Montana, and for the past two years instructor in the summer school of Columbia University, has accepted a professorship of educational psychology at Indiana University, to succeed Dean W. A. JESSUP, who goes to the State University of Iowa.

PRENTICE REEVES, A.B., of the University of Missouri, has been made instructor in psychology at Princeton University.

THE present number of the BULLETIN, dealing with race and individual psychology, has been prepared under the editorial care of DR. H. L. HOLLINGWORTH, of Columbia University.

PROFESSOR ROBERT H. GAULT, of Northwestern University, has been advanced to the position of managing editor of the *Journal of Criminal Law and Criminology*, the official organ of the American Association of Criminal Law and Criminology.

JOHN MADISON FLETCHER, PH.D., has been appointed assistant professor of experimental and clinical psychology at the Newcomb College School of Education, Tulane University.

THE following items are taken from the press:

CARL P. BOCK has been made assistant in experimental psychology at the University of Missouri to fill the vacancy created by the resignation of A. P. WEISS, who has accepted an instructorship in Ohio State University.

PROFESSOR E. C. WILM has been called from Washburn College to the chair of philosophy and psychology at Wells College.

RUDOLF PINTNER, PH.D. (Leipzig), has been appointed professor of psychology and education at Toledo University.

THE PSYCHOLOGICAL BULLETIN

GENERAL REVIEWS AND SUMMARIES

VOLITION AND MOTOR CONSCIOUSNESS—THEORY

BY PROFESSOR E. B. DELABARRE
BROWN UNIVERSITY

The papers here brought together deal with several different phases of the problem of volition: (1) The extent to which movement or action can be regarded as a factor in human consciousness; (2) the nature of the immediate antecedents of voluntary action; (3) the question as to the highest type of action; and (4) the problem of human freedom.

1. With the growing emphasis in recent thought on the active, functional and pragmatic, it is to be expected that in psychology this movement would appear in the form of an attempt to understand all consciousness in motor terms. Accordingly, Kostyleff (10) believes that consciousness is connected with the motor rather than the sensory side of the organism, and advances a dynamic conception based on the functional development of reflexes as opposed to the current view that mental states are directly due to inflowing currents or to revivals of these. Pradines (14) also claims that action is the whole of life, and is free and undetermined, as is all reality. Knowledge is nothing but a form of action, which has come to forget its own nature. Alexander (1) makes a systematic attempt to sketch a complete conational psychology. The objects of contemplation are non-mental. Conation, the act of contemplating or "enjoying," alone is mental, with feeling as one of its modalities. Psychology must describe all forms of consciousness as a series of conative acts, show their relation to their non-mental *cognita*, and make clear how they assume a speculative as well as a practical form. Dearborn (4) is more conservative, re-

taining more of the older views. As a coördinator and integrator, the central nervous system is the basis of consciousness. But muscle constitutes about half the mass of the organism; in subtlety of metabolism and intricacy of structure, in chemical activity and in the molar activities of its ceaseless tonal and occasional contraction, it is not surpassed by any of the tissues. It might well itself serve as a physical basis for consciousness. At any rate, either directly, or indirectly through kinæsthetic sensations, it is the source of the energy in the stream of consciousness and subconsciousness. Pillsbury (13) opposes the attempt to reinstate the innervation sense without new proof, holding to kinæsthetic sensations in their place. He agrees with the motor theory in emphasizing the part played by kinæsthetic qualities in every domain, but will not agree to a motor origin for all the qualities of perception, memory, selection, meaning, etc., nor accept movement as the cause of any of the antecedent conscious states. Both sensation and movement are needed for the explanation of any phase of consciousness.

2. Rowe (15) gives an extensive review of experimental and pathological literature, and opposes feeling as the initiator of voluntary movement. Feeling may inhibit or reinforce, but so long as it dominates, there is no volition. A perceptual or ideational process is essential for the initiation of a voluntary movement and involves a control based on immediate sensations and perceptions of results, of a kinæsthetic, visual or auditory nature. Bernard (3), arguing for a unitary as against an individualistic, utilitarian and hedonistic view of society, and for its scientific analysis and control, devotes two chapters to these psychological problems. The cause of an act is not feeling alone, nor ideation alone, nor even always either of these; it consists rather, as Woodworth maintains, in the total set of the nervous system at the moment, which is itself determined by numerous factors, some conscious and some unconscious. Dearborn (5, 6) also holds that every deliberate movement is the resultant of influences coming from every part of the brain or even of the entire gray fabric of the nervous system.

3. MacDougall (11) says that the system of habits gives to ideal activity its point of origin and its direction; the system of ideas gives to habit a telic value. Normal development tends towards a more complex synthesis of habit-modes and a widened ideal horizon. The highest type of self is that in which a life of the most intense intellectual activity finds its basis and its object in the fullest

organization of experience in terms of significant reactions of the will. Stocks (16) distinguishes between motive and intention. The former "is that characteristic tendency or disposition of a man in virtue of which a given act possesses an attraction for him." It is not mere feeling, is largely unconscious, and is best defined by reference to end. Intention is what is consciously present to the agent at the moment of action. The imperfectly developed character betrays in action a number of dimly apprehended and chaotic purposes. The perfect will is one in which there is no motive other than intention. Barrett (2) makes an experimental study on which he bases the following conclusions: "When a choice has to be made between two alternatives, the choice is quick and easy in proportion as the values of the alternatives are clearly and definitely known." To choose well, therefore, "we must clearly and definitely determine the values of alternatives, and that of course, as far as possible, long before the choice begins." And the "top-value" of our scale, with which nothing whatever is comparable, "must act as a charm, it must electrify us, hypnotize us." Bernard (3) has as the main thesis of his sociological study mentioned above the following: "Individuals have no liberties in opposition to a scientifically controlled society. . . . The really social individual is not one who acts with individual reference. . . . He attempts to discover the conditions of the most effective social life and then to bring these conditions about and to adjust himself to them."

4. The problem of freedom is incidentally touched upon by more than one of the authors already mentioned. Pradines (14) speaks of action as free and undetermined. Barrett (2) thinks that indirectly his study shows the worthlessness of the psychological arguments for determinism. Several are clearly written from a deterministic standpoint. Our four remaining references deal with this problem specifically. Kohnstamm (9) is the only determinist among them. He finds the scientific explanation of freedom not in the exclusion of effective causality, but in a causally determined choosing among several open possibilities. But the significance of free choice as thus defined lies not in its cause but in its end. For Field (7) it is inconceivable that our own inner experience as to the nature of the relation between motive and act could deceive us. Any attempt to describe the relation must be in terms of something not active, and so be untrue. It is indescribable, unanalyzable, because unique and singular, and this is what we mean by "free."

Horne (8) and Palmer (12) both attempt a new defense of the

libertarian position. Both define it in terms of a genuinely ambiguous future, determinable by our purposes, which themselves can never be wholly accounted for by sequential causation (12, p. 126). Palmer frankly accepts the implication of genuine chance in the universe, and admits that the existence of sin and the nature of the influence of thought on matter remain insoluble mysteries. Both authors use the conventional arguments, admit that these do not constitute final proof, and regard freedom as very limited. For both, the series of temporal phenomena cannot be explained exclusively in terms of efficient causes (which Palmer happily calls sequential), but wherever purposes exist involves also final (ante-sequential) causes; and thus, in their view, the world remains wholly causal and law-abiding. Both claim that their conception is not identical with a freedom of indifference, and Palmer says that it is not indeterministic (p. 186). Horne's work is marred by numerous misconceptions. He always confuses determinism with many things that it is not,—fatalism, predestination, necessarianism, subjection to custom and authority,—and is thus led to reverse the historical course of thought, believing it to be away from earlier determinism toward a growing belief in indeterministic freedom. He assumes that to establish a psychical cause for physical phenomena would prove libertarianism (pp. 103, 108), and that to deny interactionism is to deny efficiency for mind (pp. 83, 87, 99). He understands the mechanical theory of the universe to mean the transformation of energy only downwards (pp. 110, 114); asserts that the physical causal law claims only that every cause has an effect, not that also every cause has a cause (p. 135); takes transcendental to mean the initiation of a new causal series in the temporal order (p. 53), and thus is led to place Kant and Royce among the libertarians. Palmer understands determinism better; but he is forced to believe what a scientist can hardly concede, namely, that the world is split into numberless independent lines of sequential causality and that harmonious correspondences between these can be the result only of chance or of antesequential causation (pp. 136–150). Finally, Horne does not mention and Palmer does not adequately discuss the form of determinism which holds that sequential mechanism and antesequential teleology are compatible, that the whole world may be exhaustively explained in terms of cause but also in terms of purpose, and that the human will may be as free transcendentially as empirically it is without limitation sequentially causal.

REFERENCES

1. ALEXANDER, S. Foundations and Sketch Plan of a Conational Psychology. *Brit. J. of Psychol.*, 1911, 4, 239-267.
2. BARRETT, E. B. *Motive Force and Motivation-tracks*. London: Longmans, Green & Co., 1911. Pp. xiv + 225.
3. BERNARD, L. L. *The Transition to an Objective Standard of Social Control*. Univ. of Chicago Press, 1911. Pp. 96.
4. DEARBORN, G. V. N. The Relation of Muscular Activity to the Mental Process. Reprinted from *Amer. Physical Educ. Rev.*, 1909, 14. Pp. 8.
5. DEARBORN, G. V. N. The Nerve-Mechanism of Voluntary Movement. Reprinted from *Amer. Physical Educ. Rev.*, May, 1912. Pp. 12.
6. DEARBORN, G. V. N. Notes on the Neurology of Voluntary Movement. Reprinted from *Medical Record*, May 18, 1912. Pp. 48.
7. FIELD, G. C. The Meaning of Human Freedom. *Mind*, 1911, 20, 379-393.
8. HORNE, H. H. *Free Will and Human Responsibility*. New York: Macmillan, 1912. Pp. xvi + 197.
9. KOHNSTAMM, O. Willensfreiheit und Zielstrebigkeit. *J. f. Psych. u. Neur.*, 1911, 18, 87-101.
10. KOSTYLEFF, N. *La crise de la psychologie expérimentale*. Paris: Alcan, 1911. Pp. 176.
11. MACDOUGALL, R. The System of Habits and the System of Ideas. *PSYCHOL. REV.*, 1911, 18, 324-335.
12. PALMER, G. H. *The Problem of Freedom*. Boston: Houghton Mifflin Co., 1911. Pp. ix + 211.
13. PILLSBURY, W. B. The Place of Movement in Consciousness. *PSYCHOL. REV.*, 1911, 18, 83-99.
14. PRADINES, M. *Critique des conditions de l'action*. Paris: Alcan, 1909. 2 vols. Pp. viii + 702; ii + 305.
15. ROWE, E. C. Voluntary Movement. *Amer. J. of Psychol.*, 1910, 21, 513-562.
16. STOCKS, J. L. Motive. *Mind*, 1911, 20, 54-66.

REFLEX ACTION

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In the regular experiments with decerebrate preparations, stimulation of the afferent nerve produces inhibition of the contraction in progress. Sherrington (4) reports that this phenomenon may be reversed in the following ways. A constant weak galvanic current produces the regular inhibition at the make and break, but during the action of the stimulus gives a contraction myogram. Repeated, brief galvanic currents, each of about .04 second in length and at the rate of 12 per second, cause contraction. Weak faradic currents give weak but noticeable contraction phenomena. The weak galvanic current broken at the rate of 20 times per

second by the v. Kries rotating rheonome gives a steady, lasting contraction. Beside these changes in the intensity and form of the current, to produce the reversal of action, the muscle must also retain its tonic condition, *i. e.*, there must be entire absence of "shock." When these conditions are observed, especially with the last form of stimulation mentioned above, the contractions are closely comparable to real tonic reflexes. Some 18 seconds after this contraction had been produced, stimulation with a faradic current in the regular way gave the usual reflex inhibition. The action of the stimulation with the rotating rheonome in circuit seems to indicate that the "natural" tonic phenomenon is also produced by rhythmic and intermittent stimuli from the receptors. In a further investigation of reflex inhibition, Sherrington (3) used an artificial stimulus (background stimulation of the ipsilateral nerve) to obtain the reflex contraction of the knee flexor muscles in the cat. The stimulation of the contralateral afferent, while the contraction was still in progress, generally produced an inhibition of this reflex contraction. In certain weak stimulations of the inhibiting nerves, increased contraction is noted followed by the usual inhibitory effect. "Fatigue of the background reflex seems to favor markedly the operation of inhibition against the reflex." Rebound occurs when the inhibiting stimulus is removed, not only when the background stimulation is artificial, but also when it is a "natural" reflex, as pinching the pinna of the ear, or when the origin of the contraction is not clear. Whether reflex contraction or inhibition ensues depends upon the intensity of the reflex background as well as on the intensity of the second stimulation.

Pike (2) argues that the truth "concerning the conflicting views regarding the nature of 'spinal shock' will doubtless be found in the study of the phylogenetic and ontogenetic development, functional as well as morphological, of the central nervous system." He contributes evidence to show that "the collapse of the animal during the resuscitation period is due to the fact that the bulbar vasomotor mechanism can no longer produce any rise in [blood] pressure by a constriction of peripheral vessels after interruption of the efferent nerve channels. Occlusion of the head arteries and transection of the cord soon thereafter produced a *series of collapses*. The first collapse did not occur immediately, hence it seems improbable that the "hypothetical shock" is due to a loss of tonus impulses from above, nor does it appear probable that the secondary collapses are produced by later stimulation of efferent inhibitory

fibers, since no fall in blood pressure is noted. The assumption of a fairly definitely localized bulbar vasomotor mechanism seems to him the simplest explanation of the observed facts.

By means of the "artificial perfusion of an organ, in this case the spleen, which is completely severed from the natural circulation, by cutting or ligating all its blood vessels, but which is still left in connection with the vasomotor center of the animal," Sollmann and Pilcher (5) investigated the reactions of the vasomotor center. Both peripheral actions and the variations in blood supply from cardiac disturbances being excluded, the experiment consists in interrupting the stream of oxygen. The center is thus stimulated by asphyxia. They find that the fall in blood pressure is due to cardiac influences rather than to central vasomotor paralysis. "The results are the same whether the vagi are intact or divided." They find that sudden arrest of the heart also causes a marked stimulation of the vasomotor center. This stimulation by asphyxia does "not occur if the accumulation of carbon dioxid is prevented."

Lowsley (1) studied the relation between changes in blood pressure and all forms of exercise in athletes. He finds a rise in systolic, diastolic, and pulse pressure after all exercise. Moderate exercise causes about one-half the rise in diastolic pressure noted in other types of exertion. All the pressures fall below normal soon after the close of exercise. The pulse rate exhibits similar changes, except that it falls below normal in only four cases out of sixty. Exercise may probably be considered within hygienic limits when the subnormal phase disappears before the lapse of sixty minutes. A delay beyond one hundred and twenty minutes, as occurred after the more violent forms of exercise, appears to indicate dangerous over-straining.

1. LOWSLEY, O. S. The Effects of Various Forms of Exercise on Systolic, Diastolic and Pulse Pressures and Pulse Rate. *Amer. J. of Physiol.*, 1911, 27, 446-466.
2. PIKE, F. H. Studies in the Physiology of the Central Nervous System.—II. The Effect of Repeated Injuries to the Spinal Cord During Spinal Shock. *Amer. J. of Physiol.*, 1912, 30, 436-450.
3. SHERRINGTON, C. S., & SOWTON, S. C. M. On Reflex Inhibition of the Knee Flexor. *Proc. Roy. Soc.*, 1911, B 84, 201-214.
4. SHERRINGTON, C. S., & SOWTON, S. C. M. Reversal of the Reflex Effect of an Afferent Nerve by Altering the Character of the Electrical Stimulus Applied. *Proc. Roy. Soc.*, 1911, B 83, 435-446.
5. SOLLMANN, T., & PILCHER, V. D. The Reaction of the Vasomotor Center to Asphyxia. *Amer. J. of Physiol.*, 1911, 29, 100-107.

FATIGUE

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A valuable study and criticism of methods for dealing with the work-curve is contributed by Thorndike (5), but in so concentrated a form that one can here do little more than indicate the many phases of the problem it discusses. The work-curves of a previously published (and here reviewed) series of multiplication tests and a later series of addition experiments are studied to test the interpretations which previous investigators have put upon different real or supposititious features of the work-curve. On the whole they seem to belong mainly in the latter class; initial spurt, end-spurt, warming up, adaptation. A feature of von Voss's work on the temporal variation in mental capacity is severely handled. Fatigue is defined as that diminution in efficiency *which rest can cure*. The effects noted are very slight indeed, in accordance with the author's previous work; and its disagreement with other conclusions is elucidated. Another point is the superiority of intermittent practice over continuous practice of the same working time. The curve of mental work is actually very near a line both straight and horizontal. The feelings of fatigue are important, but these tend toward a stoppage of the work, and when this response is excluded, habit maintains the standard of speed and accuracy. In closing, a number of defects in the Kraepelinian analysis are enumerated, six in all, but the author considers that any attempt at speculative analysis could scarcely avoid similar pitfalls, well remarking that in the present state of knowledge it is far better to analyze a work-curve by experiment than by deduction, which, in passing, is not true of the work-curve alone, among present psychological problems.

Winch (7) reports a study of the effect of school hours upon performance in arithmetical problems, along the same lines as his work on the value of the night school, previously reviewed in these columns. Four series of experiments were made, two in boys' schools, and one in girls' and infants' schools, all in surroundings below the average social standing. The number of subjects in each series ranged between 49 and 60. As in the previous research, preliminary tests in the functions to be measured were given, by means of which the two "equal groups" were arranged. One group would then work at arithmetical problems early in the morning, while the others

were given the same problems in the late afternoon. Any lowering in efficiency due to the work of the school day would be shown in a decreased ability of the otherwise equal afternoon group. Both groups may be expected to improve on the records of the preliminary tests, so that the results are presented in terms of the per cent. of this improvement, showing the difference in this respect between the morning and afternoon work. In the infants' school however (ages 6-7) the afternoon work showed no improvement over the preliminary records, seeming accordingly to the author useless; the morning work showed over 12 per cent. of improvement. In two experiments with boys and girls respectively, the ages being about 11 years, the averages of both morning and afternoon work improved on the preliminary records, but the excess of improvement in the morning work was some 7 per cent. The fourth series, in a boys' school with subjects of about 13 years, showed rather slight improvement of both groups over the preliminary tests, but the excess of the morning over the afternoon work was about 3 per cent. The author concludes by remarking that the results are in general accord with the opinions prevailing in the best current pedagogy; the fatigue effects are very much lessened as the children rise in age and mental capacity.

Ritter (4) describes a series of experiments with school children by a method in which he expresses considerable confidence, a *Dictierverfahren* adapted from Ebbinghaus, involving essentially a memory process. There is a considerable review of other educationally used methods also. The experiments regularly show an increase in the number of errors with progressive school work, and according to the special conditions a number of inferences regarding school economy are drawn. The conduct of a summer *Ausflug* afforded an opportunity to test the performance in relation to physical fatigue. It did not seem to be especially affected thereby.

Two interesting studies of the industrial bearings of the fatigue problem are contributed by Bogardus (1). Its phases are enumerated by him as (a) the relation of fatigue to industrial accidents, (b) fatigue and industrial inefficiency, (c) fatigue and susceptibility to contagious diseases, (d) fatigue and nervous diseases, (e) fatigue and future generations, (f) fatigue and morals of working people. The present articles deal with the first of these; how does modern industrial labor affect the normal development of fatigue, and what are the observable circumstances under which these processes result in accidents? Can the subjective fatigue process be measured by

means of controlled experiments in terms comparable to the observable conditions preceding accidents, and thus be causally related to them? A brief account is given of the physiological chemistry of fatigue, and it is brought out that an important feature of it is to diminish the accuracy of motor coördinations, whose relation to accident is obvious. The writer's observations are that these are characteristic of the phenomena immediately preceding industrial accidents. Monotony resulting from the specialization of tasks is emphasized. Then too, the tension under which work is done diminishes the feeling of fatigue, increasing the liability to exhaustion. Some figures of excessive work periods are given. Two thousand six hundred and seventy-eight accidents are analyzed as due to causes beyond the control of the injured, or to faulty reactions on their part. There seems to be a misprint making a discrepancy in the presentation, but it appears that 2,203 or 82 per cent. of these involved fatigue as a causal factor. A series of experiments was conducted in a laboratory at Chicago University, in which the operation of machinery at a dangerous trade was simulated as closely as practicable, showing a score of errors doubled for the second half of a fifteen-minute experiment over that of the first half. Speeding up increased the disparity. The individual differences are referred to a temperamental basis.

Despite the promise of the "*Beeinflussung einfacher psychischer Vorgänge*," and the further emphasis laid by Kraepelin on its problems under the concept of the *künstliche Geistesstörung*, the experimental psychology of drugs has not proved a field attractive to most investigators. Hoch and Kraepelin observed the effects of the tea-constituents. Haenel also, and Loewald, directly under Kraepelin's influence, made special studies of trional and bromide respectively, besides which there are the researches of Rivers, Rüdin and others on alcohol. Experiments upon single mental functions with various drugs have also been reported. But the necessary conditions for such experiments are not easy for the ordinary laboratory to meet, and, it is possible that they have never been so adequately met as in the study by Hollingworth (2) of the influence of caffeine upon various mental and bodily activities. The circumstances of the work were unusual and occasion the appearance in the book of some matter that is absent in the usual presentation of research; yet the immediately satisfactory result of the work may well lead to other similar applications, to the proper external precautions in which the present volume should be a useful guide. A

general series of experiments was performed with small, medium and large doses of caffein. Neither experimenter nor subject knew whether the dose was of caffein or a control. The general result of the experiments is that of stimulation without secondary depression, confirmatory to the previous conclusion of Rivers.¹ An extended account is given of the amount and character of sleep as well as of the general health of the subjects during the experiment. There is a uniform gain in health owing probably to the regular living occasioned by the experimental conditions. After larger doses (4 gr. and over), "nervousness," dizziness and headache, with disturbed sleep, were apt to follow. Increased constitutional susceptibility appears to be rather a function of body weight than other factors, and the effect also depends upon the presence of food in the stomach. No *Abstinenzerscheinungen* seem to have occurred where they might have been expected. The experiments are generally evaluated in such a way as to express efficiency in the whole test, so that they do not measure the influence of caffein on fatiguability, but indicate that it would serve to arrest the fall of the work-curve in most of the functions tested.

Apròpos of the work of this author here cited last year, may be mentioned Weber's (6) reply to a criticism of his book by Leschke,² that the former fails to make proper use of introspection in his results, and publishes selected curves without a statement of the number of cases in which the characteristic changes did not take place. Weber replies in the first instance that the use of hypnotic suggestion, by an operator acquainted with his subject, obviates the necessity of introspective accounts. In the second, he replies essentially that the exclusion of the negative records was justified on the ground of intercurrent accidents which obscured their interpretation. Leschke (3) declines to regard these explanations as satisfactory.

On the whole, the attack upon the problem of fatigue from the psychological side might on the surface appear somewhat disorganized. Instead of the coördinate investigations that came from Kraepelin's laboratory, and the work that centered about the æsthesiometric method and the ergograph, researches now take on the form of studying a very specialized situation by such method or methods as are specifically adapted to it. This indeed is as it should be, for the problem is a complex if not also a compound one;

¹ For a tabulated statement of experiments and results see p. 422.

² *Arch. f. d. ges. Psychol.*, 1911, 21, 435-463.

we may regret the difficulty, but not the fact that we are learning better to recognize and deal with it. Fatiguability can be measured more satisfactorily in some functions than in others. In one of these we may yet find a measure of fairly general application, or it may be that the search for the "measure of fatigue" is wholly a Ponce de Leon's quest; but the specific educational and hygienic problems in the economy of effort and the safeguarding of our energies the above researches have placed us in a distinctly better position to encounter.

REFERENCES

1. BOGARDUS, E. S. The Relation of Fatigue to Industrial Accidents. *Amer. J. of Sociol.*, 1911, 17, 206-222; 351-374.
2. HOLLINGWORTH, H. L. The Influence of Caffein on Mental and Motor Efficiency. *Arch. of Psychol.*, No. 22, 1912. Pp. 166.
3. LESCHKE, E. Erwiderung, etc. *Arch. f. d. ges. Psychol.*, 1911, 21, 581.
4. RITTER, C. Ueber Ermüdungsmessungen. *Zsch. f. angew. Psychol.*, 1911, 4, 495-545.
5. THORNDIKE, E. L. The Curve of Work. *PSYCHOL. REV.*, 1912, 19, 165-194.
6. WEBER, E. Bemerkungen zu der Abhandlung, Die Körperl. Begleiterscheinungen seelischer Vorgänge. *Arch. f. d. ges. Psychol.*, 1911, 21, 579-580.
7. WINCH, W. H. Mental Fatigue in Day-school Children, as measured by Arithmetical Reasoning. *Brit. J. of Psychol.*, 1911, 4, 315-341.

PSYCHOLOGICAL ASPECTS OF DRUG ACTION

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Very little of the past year's work on the influence of drugs has any particular psychological interest. Several symposiums on anæsthetics have dwelt chiefly on the practical aspects of the topic. Hirschel (2) sketches the development of the use of local anæsthetics (suprarenin, cocain, novocain). Short and Salisbury (13) have demonstrated that none of the commonly used drugs for superficial application (belladonna, atropine, aconite, opium, chloroform, carbolic acid, cocaine, menthol) possess any anæsthetic properties when applied to the unbroken skin (ethyl chloride, which freezes the skin, is the single exception to this generalization). Veley and Symes (14) discuss the physical properties of stovain and its homologues, and report investigations of their effects on contractility of isolated muscle, blood pressure, respiration, and nerve conductivity. On the central nervous system and circulation Fournau's new salt is less active and methyl stovain at least no

more active than stovain. Amyl stovain is less active on the nervous system and its depressant effect on circulation is greater and more gradual. Tested by the effect on conductivity of frog's nerve, stovain and its homologues are more active local anæsthetics than is cocaine. Examination of the anæsthetic block in individual nerve fibers indicates that the amplitude of a muscle twitch depends on the number of fibers involved. Judged by muscular response the anæsthetic block in individual nerve fibers to impulses evoked by maximal stimuli, throughout a wide range of intensity, is complete or zero.

From an analysis of cutaneous sensations as influenced by ethyl chloride Franz and Ruediger (1) are led to conclude that the hairs possess two distinct sensory end-organs, the one concerned with sensations produced when the hair is brushed lightly, the other concerned with sensations resembling pain and pressure, and resulting from traction of the hair. In the case of the temperature sensations no such normal dissociation was found. Differences in the rate of recovery of sensibility are relied on in making these analyses. Raimann (11) distinguishes between specific and purely individual reactions to drugs, from the point of view of their effects on consciousness, and raises the question whether all psychopathological phenomena are not toxic in the long run. Isserlin (8) seeks to defend Kraepelin's work on the effects of alcohol on the capacity for work. The article is a reply to criticisms of Moll and is purely controversial in character. Jacobson (9) reports observations made during a 15-minute nitrous oxide anæsthesia and discusses recent papers of a similar sort. He finds reason to believe that the "higher" functions (intellection) may persist for some time after "lower" functions, such as vision, have failed. Consciousness is reported as having been present at the very moment of the operation in the interest of which the anæsthetic was taken. Langfeld (10) reports experiments to determine the influence of caffeine on "suppression with negative instruction." The effect was found to be an acceleration of the association reaction time with no deterioration of inhibition.

Hollingworth (3, 4, 5, 6 and 7) reports experiments on the influence of caffeine on mental and motor performance in typical tests (tapping, steadiness, coördination, perception, association, discrimination, calculation, cancellation, typewriting, quality and amount of sleep, general health, weight, etc.). Attention may be called to the attempt to develop a rigorous experimental tech-

nique and a standardized series of tests for future work in this field. Points of method and the respective merits of the various sorts of tests are contained in the complete report (6). The experimental results are summarized in a schematic table which is reproduced here.¹

THE INFLUENCE OF CAFFEIN (HOLLINGWORTH)

St.—Stimulation. O—No Effect. Ret.—Retardation.

Process	Tests	Primary Effect			Secondary Reaction	Action Time in Hours	Duration in Hours
		Small Doses	Medium Doses	Large Doses			
Motor Speed	Tapping	St.	St.	St.	None	.75-1.5	2-4
Coördination	Three Hole Typewriting	St.	O	Ret.	None	1-1.5	3-4
	(a) Speed (b) Errors	St. Fewer for all doses.	O	Ret.	None None	Results show only in total day's work.	
Association...	Color-naming	St.	St.	St.	None	2-2.5	3-4
	Opposites	St.	St.	St.	None	2.5-3	Next day
	Calculation	St.	St.	St.	None	2.5	Next day
Choice.....	Discrimination	Ret. Ret. O	O	St.	None	2-4	Next day
	Reaction time		?	St.	None	3-5	No data
	Cancellation		O	O			
General.....	S-W Illusion	O	O	O			
	Steadiness	?	Unsteadiness		None	1-3	3-4
	Sleep Quality	Individual differences, depending on body weight, time of administration, presence of food substance in the stomach, etc. No correlation with age, sex, or previous caffeine habits.					
	Sleep Quantity						
	General Health						

Robinson (12), in a 16,000-word dithyrambic essay considers hasheesh "from the historic, botanic, microscopic, chemic, physiologic, therapeutic, pharmacologic" and psychological viewpoints, and contributes a sonnet to the drug. The "experiments" consisted chiefly in administering hasheesh to individuals, whose subsequent behavior, conversation, and general impressions are recorded. Two subjects give retrospective accounts of the subjective features of hasheesh intoxication. Principal psychological results: There is no record of a fatal dose; idiosyncrasy is important; the drug is a powerful narcotic, producing euphoria, erotic visions, superficial associations, disturbance of time sense; tendencies to dissociation are also reported.

¹ See also p. 418.

REFERENCES

1. FRANZ, S. I., and RUEDIGER, W. C. Sensory Changes in the Skin Following the Application of Local Anæsthetics and Other Agents.—I. Ethyl Chloride. *Amer. J. of Physiol.*, 1910, 27, 45-59. *Bull. Gov. Hosp. for Insane*, 1911, 3, 15-26.
2. HIRSCHL, G. Fortschritte auf dem Gebiete der Lokalanästhesie. *Med. Klin.*, 1911, 7, 1721-1724.
3. HOLLINGWORTH, H. L. The Influence of Caffein on Performance in Typewriting. *PSYCHOL. REV.*, 1912, 19, 66-73.
4. HOLLINGWORTH, H. L. Influence of Caffein on Quality and Amount of Sleep. *Amer. J. of Psychol.*, 1912, 23, 89-100.
5. HOLLINGWORTH, H. L. Influence of Caffein on Efficiency. *Therap. Gaz.*, January 15, 1912. Pp. 16.
6. HOLLINGWORTH, H. L. *The Influence of Caffein on Mental and Motor Efficiency.* (Archives of Psychology, No. 22.) The Science Press, Sub-station 84, New York City. Pp. 167. \$1.75 (cloth).
7. HOLLINGWORTH, H. L. Experimental Psychology and the Question of Public Health. *Ariz. J. of Educ.*, 1912, 3, 11-14.
8. ISSERLIN, M. Kraepelin's Experimente mit kleinen Alkohol-dosen. *Zsch. f. d. ges. Neur. u. Psychiat.*, 1911, 6, 589-604.
9. JACOBSON, E. Consciousness under Anæsthetics. *Amer. J. of Psychol.*, 1911, 22, 333-345.
10. LANGFELD, H. S. Suppression with Negative Instruction. *PSYCHOL. REV.*, 1911, 18, 411-424.
11. RAIMANN, E. Bewusstsein und Intoxikation. *Ber. IV. Kong. f. exper. Psychol.*, 1911, 242.
12. ROBINSON, V. *An Essay on Hasheesh, including observations and experiments.* New York: Medical Review of Reviews, 1912. Pp. 83. \$0.50.
13. SHORT and SALISBURY. The Action of Cutaneous Anæsthetics. *Brit. Med. J.*, 1910, 1, 560-563.
14. VELEY, V. H., and SYMES, W. L. Certain Physical and Physiological Properties of Stovain and its Homologues. *Proc. Roy. Soc.*, 1911, B83, 413-420; 421-432.

SPECIAL REVIEWS

INDIVIDUAL PSYCHOLOGY

Henri Poincaré. Dr. E. TOULOUSE. (*Enquête médico-psychologique sur la supériorité intellectuelle. Tome II.*) Paris: Flammarion, 1910. Pp. 204.

This book is one of a series of studies, the purpose of which is to investigate, by the clinical method, the relation between intellectual superiority and neuropathy. The plan is to proceed, without prejudice, by testing several superior men by experimental methods, in order to determine their physical and mental characteristics. It is hoped that in this way some light may be thrown on the psychological conditions of genius. Toulouse has already reported (1896) such a study of Zola.

Zola's type was found to be characterized by prominent voluntary intellectual activity, clearly conscious, capable of intense, concentrated effort, with no tendency to perseveration after cessation. His thought, as disclosed by the tests, was logical, methodical, and seemed preëminently fit for the work of mathematical deduction. The surprising thing was that such a type should have become the prince of romance that Zola turned out to be. The tests of Poincaré show him to present a striking contrast with Zola. His mental processes were shown to be flighty, uncontrolled, and spontaneous; his attention instable and easily distracted; his performance irregular and spasmodic, disclosing an evident neuropathic basis,—apparently a type preëminently fitted for romance, but finding its outlet in severe mathematical and philosophical creation.

The tests (which were made thirteen years before their publication) followed a technique which the author now recognizes to have been quite imperfect and fragmentary, but they are said to have yielded results quite sufficient to characterize the intellectual type of the man. The investigation took account of the special topics of heredity, development, physical condition, sensory acuity, various kinds of memory, attention, imagery, reaction time, association of ideas, language and handwriting, character, habits, opinions. The account of the tests is followed by a synthesis in which is attempted a general picture of Poincaré's type, and an interpretation of the conditions of invention and speculative genius.

The biographical sketch is meager and the attempts to trace far-reaching effects of minor juvenile events are anything but convincing, although they are of course offered only as suggestions. Poincaré resembled most his mother and grandmother, who, with collateral relatives, are said to have shown special aptitude for mathematical calculations. Several male members of the family have had successful careers in neurology, meteorology, law, politics and mathematics. There are traces of arthritic and rheumatic heredity.

Poincaré's development was not precocious, although he was bright and showed, when quite young, mathematical ability of an unusual order. His history, up to the age of 30 years, at which time he was elected to the Academy of Sciences, was not unlike that of many other mathematicians whose freedom from the necessity of experiment allows them to make rapid progress. He was at one time troubled by rheumatism, and in his childhood suffered from a serious attack of diphtheria, followed by paralysis. This attack is said to have profoundly modified his nervous system, perhaps providing the neuropathic basis for traits shown in later life,—such as awkwardness, restlessness, flighty attention, distraction and general sensori-motor deficiency.

The physical examination, anthropometric measurements, and strength tests, along with the inquiry into habits of eating, sleeping, and the use of narcotics, revealed nothing very unusual. Poincaré had head measurements somewhat larger than the average. He was troubled with indigestion, did not use tobacco, used wine and coffee only sparingly, and was troubled with insomnia. He was able to work for but four hours a day, in two-hour periods, and the tendency to automatisms and perseveration of psychic activity compelled him to cease work for some time before retiring. He disliked muscular exercise except for the automatic processes involved in walking. His absent-mindedness was a matter of common comment.

The eye and ear examination are said to have shown Poincaré to have been "rather feeble from a sensory point of view," although the defects found do not strike the reader as being at all unusual. Hearing was defective for low tones; orientation and localization fair. There was myopia but no astigmatism, and campimetry tests showed no abnormality. Muscular weakness was found, which led to accommodation spasms. Poincaré had no visual images or memories, except in the transition state between waking and sleep-

ing, when he had frequent visual hallucinations of remarkable distinctness. In his waking life he relied on motor images and tendencies, thinking of geometrical forms in terms of optical or manual movements. He had no visual "schemes," but represented time by a rotation of the eyes on their axes. In his youth he had pronounced colored hearing, which was evoked not by the form but by the sound of the letters. In the case of the vowels three of the letters corresponded to the average found by Flournoy and Claparède, who finds one out of seven people to have this colored hearing. Poincaré had no other synæsthesias. His movements were characterized by uncertainty, irregularity, awkwardness and hesitancy, and muscular reflexes were prominent.

Tests of recognition memory for the length of lines (a total of only 14 different trials on 6 different standards) showed large errors in the case of one line, and this is taken to be significant of vacillating attention. On the basis of these few trials Poincaré is compared with Zola and with Dalou, who made similar trials. In the case of reproductive memory a total of 15 trials on 5 different standards is taken to afford sufficient evidence that with Poincaré reproductive memory was poorer than recognition memory. A few attempts at reproducing drawings exposed for 5 seconds are said to have shown exceptional capacity in this respect, but the tests were fragmentary and uncontrolled. The memories were held with the aid of motor imagery, and the reproduction was often not from the image but on the basis of an analysis of the material.

Poincaré's memory span for digits was about 11 (as compared with the ordinary record of 7 or 8). He had an auditory span for letters of about 9 and a visual span of about 7. Brute memory (as in the cases of Zola and Dalou as well) did not seem to be particularly good. Much emphasis is laid on Poincaré's tendency to use memory devices in remembering this non-logical material,—he employed analysis and incidental schemes whenever possible. He had "a remarkable facility in mental calculation" which is said not to be the rule with mathematicians.

In logical memory Poincaré was superior to both Zola and Dalou, and in the case of logical material his memory is again seen to be analytical and artificial rather than brute,—all material was placed in a coherent system, and it was the system rather than the material which was remembered. This tendency to organize is said to be a result rather than a cause of Poincaré's high order of intelligence.

The cancellation and reaction time tests lacked standardization and mean nothing as they stand. The simple sensory reactions are said to have been slower and more regular than those of the average person, but the motor reactions much quicker. This accords with the previous statements as to his general motor type. The most significant thing about the reactions is said to be the wandering and instable attention which they disclosed. It was difficult to keep Poincaré's mind on the tests, because his attention constantly wandered to the apparatus. In receiving instructions for such experiments Poincaré did not seem to comprehend what was being said, but appeared distracted and uninterested. He is said to have given the same impression to those whom he met in his daily relations. He was restless, could not remain lying in one position or stay by one task, had no patience and abandoned his work whenever it seemed to require any voluntary effort.

Tests of reverie associations and of free paired associates showed absence of voluntary attention and predominance of purely verbal association tendencies. (This conclusion is based on a single list of 12 words written at random, and on a single list of the same number of paired associates.) Binet's "cigarette description" test was used, and Poincaré found to belong to Binet's first type of observer (simple description, with no evidence of reflection or judgment, no display of erudition, no expression of fancy or sentiment). His description was remarkably lucid and clear.

Poincaré spoke correctly, never learned his addresses by heart, and made few corrections either in writing or in speaking. Indications of his temperament and type are said to be revealed in his handwriting.

Poincaré's opinions on various topics are given and several peculiar habits of daily life enumerated, chiefly for the sake of emphasizing his constant air of distraction, his impatience and restlessness. He loved music, sketched a little, did not sleep soundly, and often began to work on a problem only to abandon it in the faith that it would somehow solve itself unconsciously or that the right idea would come spontaneously on a later occasion. He often began a memoir without having his conclusion in mind, or even the development of the problem. He often wrote formulæ automatically for the sake of the chance associations which they might bring. Quite in contrast with Zola, when he met with a difficulty or with a point requiring voluntary effort, he abandoned his work or proceeded to another part of it which would develop more spontaneously.

Poincaré's genius is thus said to be incapable of explanation on the basis of his sensori-motor equipment, his memory, or the speed or control of his psychic activity. But his tendency to distraction, automatisms, oscillating attention, restlessness, uncontrolled associations, his reliance on chance syntheses and spontaneous ideas are held to be significant for the type of genius required for mathematical and philosophical speculation. In Poincaré's case they seem to have constituted a definite method of research. His intellectual activity was, above all, spontaneous and automatic.

These traits may be supposed to have rested on a more or less definite neuropathic basis. In extreme forms these distractions, the flights of attention and ideas, the automatisms and the verbal associations, the perseverations, etc., appear in marked forms of idiocy and insanity. When not extreme and when directed by some special aptitude (such as a congenital mathematical bent) they seem to be the condition of such creative and inventive genius as Poincaré possessed. Inventive genius is characterized by creation, and creation is a spontaneous activity or coördination which may be given direction by some dominant interest or aptitude. Genius is related to insanity chiefly by virtue of the common characteristic of instable attention and spontaneous ideas and associations. "There is but one psychology; its laws are common to an imbecile and to an Aristotle."

In evaluating this study it is not necessary to emphasize unduly the question propounded in its preface,—“Is genius a neurosis?” Its chief value seems to the reviewer to lie in the fact that it is an interesting attempt to study in a more or less intimate and intensive way the psychological processes and type of an individual of marked achievement. It is much to be regretted that the experimental technique was not more systematically elaborated and standardized, for in these days of interest in mental tests it would be valuable to know the ways in which such admittedly superior individuals as those enumerated by Toulouse,—Zola, Berthelot, Dalou, Rodin, Puvis de Chavannes, Saint-Saëns, Edmond de Goncourt, Daudet, Lemaître, Loti and Mallarmé, differing as they do in their types of achievement, would react to the simple tests now employed by those interested in the measurement of intelligence.

Some of us are inclined to believe that these tests, which are at best tests of capacity only, will never be able to throw much light on the individual's probable performance in competitive life. The concrete psychological life depends as much on motive as it does on

capacity, and the degree to which motive and capacity sustain each other is a difficult thing to measure under laboratory conditions. It is to be hoped that Dr. Toulouse will utilize the improvements in technique presented in his recent experimental manual or in other test series of a similar kind in giving us more of these intimate and intensive psychological biographies.

H. L. HOLLINGWORTH

BARNARD COLLEGE, COLUMBIA UNIVERSITY

APPLIED PSYCHOLOGY

Increasing Human Efficiency in Business. WALTER DILL SCOTT.

New York: The Macmillan Company, 1911. Pp. 331. \$1.25 net.

Business men are commencing to look to psychology as a possible assistance in their affairs. Only a few years ago any reference they might make to it was of a derogatory character. But their conception of the nature of psychology and of its possible applications has undergone an enormous change. Today there are constant references to psychological theories in all of the business and advertising journals. Some of these, indeed, still frankly oppose the idea that there is anything of practical value to be found in a so-called "academic study," but such writers are among the minority.

The writer of the book before me is one of the first psychologists to write for the business world. Today, he is known to nearly every advertising man in the country. To him is due much of the credit for the changed attitude toward psychology which has just been pointed out.

His first two books dealt with the application of psychology to advertising, his third with salesmanship and this, his fourth book, is concerned with the problems of the business executive. In this he has taken up such general psychological terms as "imitation," "pleasure," "loyalty," "relaxation," etc., and devoted a chapter to each. General principles are stated and each is illustrated by many concrete examples. The last four chapters deal mainly with "habit formation." Several practice curves of his own and of other investigators are given and the chief principles to be deduced from them are stated.

The book contains nothing new to the psychologist. It was not written, however, for him, but for the business man. Technicalities are largely eliminated and the whole work is mainly inspirational

and suggestive in character. It should, however, be useful to the psychologist as auxiliary reading in general courses, as it gives large opportunity for the application of general principles to concrete cases.

The reviewer wishes that the book had contained some reference to the recent work on "fatigue," "optimum working periods," etc. The steady increase in output per worker in present-day business is developing a new problem for careful study. We need to know what are the limits within which a worker may increase his productivity without becoming liable to disastrous "after-effects." To have discussed the subject of "relaxation" and "competition" and not to recognize that there is danger from overwork (aside from "worry," which apparently can be eliminated) is a serious defect to my mind. Psychology has much in store for the business world in teaching better methods of work, but it will not have done its duty until it has also pointed out the limits to the length and speed of work which cannot be exceeded without permanent injury to the worker.

EDWARD K. STRONG, JR.

COLUMBIA UNIVERSITY

ÆSTHETICS

Beauty and Ugliness and Other Studies in Psychological Æsthetics.

VERNON LEE and C. ANSTRUTHER-THOMSON. London and New York: John Lane Company, 1912. Pp. ix + 376.

The five studies making up this volume begin with an essay on "Anthropomorphic Æsthetics" having for its theme that "the discovery of this projection of our inner experience into the forms which we see and realize is the central discovery of modern æsthetics." The second paper "Æsthetic Empathy and its Organic Accompaniments" is a translation from Vernon Lee's original French in the *Revue Philosophique* for 1907. The third "The Central Problem of Æsthetics" has appeared in the *Zeitschrift für Aesthetik*, 1910, and the fourth "Beauty and Ugliness" is reprinted from the *Contemporary Review* of 1897. The fifth study entitled "Æsthetic Responsiveness" is a series of extracts from Vernon Lee's gallery diaries from 1901 to 1904. These observations upon her æsthetic reactions to various works of art were noted down in the galleries or within twenty-four hours of the time of observation. They have not been worked over into essay form "because,"

the author writes, "I wanted to place my materials unspoilt at the disposal of other students."

The chief point of theoretical interest in the book is the modification, by Lee, of the theory put forth in the early essay on Beauty and Ugliness. It will be remembered that in that essay the authors based their theory of empathy (though it was not then called by that name) upon the James-Lange theory of emotion, and explained the æsthetic enjoyment of visible beauty as a function of the physiological changes—circulation, respiration, imitative muscular adjustments, etc.—occasioned by the view of the object, and felt by the observer as a mass of sensory data. Vernon Lee is now inclined to believe that it is not necessary always to have actual sensory experience of these processes during æsthetic empathy. She holds, rather, that with some observers the attribution to the object of one's own condition takes place in terms of mental imagery—especially kinæsthetic imagery—instead of present sensational experience.

One purpose of the book is to stimulate experimental psychologists to the study of æsthetic appreciation for visual form. Much more, however, has been done in this field, particularly in America, than the author seems to recognize.

It is important for students of æsthetics to have the writings of Lee and Thomson on this subject gathered into a book. And a new and real contribution has been made in the mass of introspective records from the gallery notes.

The book is agreeably printed and contains nine attractive plates.

KATE GORDON

LOS ANGELES

ANTHROPOLOGY

Psyche's Task. A Discourse concerning the Influence of Superstition on the Growth of Institutions. J. G. FRAZER. London: Macmillan, 1909. Pp. 84.

Any one who values his time is likely to eye Frazer's recent extensive works with the wish that several volumes might be transfigured in some non-Euclidean way into the dimensions of an hour's reading. This of course cannot be done, for their method is essentially anecdotal, and any attempt to reduce their extent would result in elimination and not in condensation. Nevertheless, in *Psyche's Task*, under an obscuring title and without professing to do so, Dr. Frazer has epitomized for us a train of thought which

permeates and perhaps dominates all his writings. The discourse is dedicated to "all who are engaged in Psyche's task of sorting out the seeds of good from the seeds of evil." To such seriously intending persons the author of the *Golden Bough* presents a carefully selected group of characteristic anthropological anecdotes by which he proposes "to prove, or at least make probable, that among certain races and at certain stages of evolution, some social institutions which we all, or most of us, believe to be beneficial, have partially rested on a basis of superstition." Some justification for such a multitude of saving clauses will be granted when we find that the institutions in question are civil government, private property, marriage, and the secure enjoyment of human life.

It would be distinctly unfair to give the impression that the author rests these institutions entirely upon a basis of superstition, or that he praises superstition. And yet the reviewer, compelled as he is to believe that there is a meaning in the discourse, retains the impression that there is a dilemma implied which is none the less convincing for not being expressed. The author seems to mean that either these institutions lack a good deal of the sanctity which some of the unthinking of us incline to attach to them, or else superstition is sanctified by its parental relation to them.

In the case of civil government superstition has worked mostly through the taboo, placing a hedge of sanctity around the personal head of the government. The supposed sanctity of the chief is his principal or only means of enforcing his orders. This sanctity extends to his belongings, and we have accounts, of psychological interest, of persons who have died after learning that they had inadvertently used the king's lost tinder-box or eaten the remains of his dinner. Because of his sanctity and of his relations with spirits there is often ascribed to the king power over the rains and the fruitfulness of the soil; and then the author, with no visible smile in the printed page, proceeds to say that in Africa "droughts or famine are set down to the weakness or ill-will of the king and accordingly he is punished, or deposed, or put to death." After that we are told in conclusion that "many peoples have regarded their rulers, whether chiefs or kings, with superstitious awe as being of a higher order and endowed with mightier powers than common folk. Imbued with such a profound veneration for their governors and with such an exaggerated conception of their power, they cannot but have yielded them a prompter and more explicit obedience than if they had known them to be mere men just like

themselves." This proves the value of superstition as a foundation of government.

With regard to private property the case is simple. Almost universally primitive and other peoples have relied upon one another's superstitious fears to secure themselves in the possession of whatever they have acquired. Taboo, magic, the imprecations of the owner, all impress the covetous with the dangers of stealing. It is not impertinent to remark however that our author calls attention later on to the enormous waste and destruction of property for which superstition is responsible. If superstition is conservative of private property rights, it is not conserving of property in general; the destruction of property in connection with funerals is an instance of waste directly due to superstition and to that alone.

Marriage, or the tribal code of sexual relations, is protected by a great number and variety of superstitious sanctions. Breaches of the marriage laws are generally believed to affect the community as a whole, causing public calamities such as droughts. "Wherever these superstitions prevail it is obvious that public opinion and public justice will treat sexual offences with far greater severity than is meted out to them by peoples who, like most civilized nations, regard such misdemeanors as matters of private rather than public concern. . . . And conversely, wherever we find that incest, adultery, and fornication are treated by the community with extreme rigor, we may reasonably infer that the original motive for such treatment was superstition." The question why various peoples come to regard certain relations of the sexes as immoral is mentioned and left unanswered, but the connection between disorders of nature and disorderly sexual relations is traced to the belief that a connection exists between reproduction in nature and reproduction in man; men mimicking or recapitulating the processes of nature exercise a magical influence over them.

Finally superstition, notably the fear of ghosts, has sanctified human life. In this section the argument, if there is any, is exceedingly obscure, and seems to the present writer quite inconclusive. To be sure there is evidence that murderers are made uncomfortable under the system of quarantine by which the community seeks to protect itself from the evil spirits who dog the heels of man-slayers. But there is no evidence of any such fatal results to the murderer as those which overtake the petty thief or those who trespass upon the king's prerogatives. The ghosts of the slain are less discriminating in their vengeance than the spirits who maintain the taboo.

"Indeed the ghosts of all who have died a violent death are in a sense a public danger; for their temper is naturally soured and they are apt to fall foul of the first person they meet without nicely discriminating between the innocent and the guilty." Out of a varied array of ceremonies having to do with the protection of the living from the spirits of the dead there is not one item which indicates that the primitive mind recognizes any difference between the dead who have been respectfully treated before their death and the victims of human violence; all the dead are equally dreaded, no matter how they came by their death. The most cruel of the social punishments which are mentioned are not those accorded to murderers but to innocent widowers. "His miseries begin with his wife's death. He is immediately stripped of all his ornaments, abused and beaten by his wife's relations; his house is pillaged, his gardens devastated. . . . He may not hunt or fish with the others, his presence would bring misfortune; the spirit of his dead wife would frighten the fish or game. . . . If he were dead he could not be ignored more completely. He has become a nocturnal animal. He is forbidden to show himself in public, to traverse the village, to walk in the roads and paths." Is it the author's naiveté or a sly malice that lets him introduce as an evidence of the influence of superstition in increasing the respect for human life the Fijian custom of forestalling subsequent spirit activities by burying the aged and sick alive? A more forceful, if less trustworthy, report is presented in the case of the Chinese, whose reverence for the spirits of the dead is said to increase their respect for the aged and helpless, and who are said also to resort to suicide in order to free themselves from the limitations of the body and so as ghosts to torment those who have injured them.

Having shown that superstition has been helpful in developing government, private property, marriage, and respect for human life, the discourse closes by insisting that right action is more valuable than right opinion, and that we should not be blind to "the benefit which superstition has conferred on society by furnishing the ignorant, the weak, and the foolish with a motive, bad though it be, for good conduct." To what extent government, private property, marriage, and respect for human life still rest upon superstition the reader is left to guess for himself.

THE ASSOCIATION EXPERIMENT

Untersuchungen über die Konstanz und den Wechsel der psychologischen Konstellation bei Normalen und Fröhndementen (Schizophrenen).

W. PFENNINGER. *Jahr. f. psychoanal. u. psychopathol. Forsch.*, 1912, 481-524.

Experimentelle Beiträge zur Psychologie des psycho-galvanischen Phänomens. ESTHER APTEKMAN. *Ibid.*, 591-620.

The outlook upon the association experiment is broadened several degrees by these two studies, which are the same in make-up and general viewpoint. In the first and longer of the two, the same association experiment of 100 words was repeated with 8 normal subjects, 4 men and 4 women, eight times at weekly intervals; a similar procedure was carried out with 11 cases of dementia præcox, 6 men and 5 women. The reaction times of the women begin about a third longer than those of the men, decrease more regularly, and end somewhat shorter. The tendency to change the response-words is somewhat more pronounced in the men than in the women subjects, and progressively decreases in both; more rapidly with the men at the end, in the women at the beginning. *Komplexmerkmale* are pronouncedly more frequent in the women, and do not decrease in the later series so much as those of the men. The changed responses show through all series somewhat longer reaction times than those which are not changed. In the relation of the *Komplexmerkmale* to the tendency to change responses, those without *Komplexmerkmale* are changed much less than those with them, but in the detail of the latter there is a complicated sex difference, which the author endeavors to interpret. The stimulus words are characterized in the earliest series by more *Komplexmerkmale*, the more change they are to show. Those associations which are inconstant attach to the more emotional constellations. Associations which are later to change also have longer time in the first and second repetition. The author seems also to believe that there is a significant tendency for the time of an association to be longer if it is to show a change in the next repetition. In the later repetitions, the changed responses concentrate themselves upon stimulus words which have also given rise to earlier change, *i. e.*, certain stimulus words show throughout special liability to changed responses. These associations are apt to be grouped (*Störungsketten*) with evidences of perseverative phenomena.

The reaction times average some three to four fold longer in

the pathological cases, and the difference between the men and women is, except at first, more marked than in the normal. (Initially the reaction time of the women averages shorter than that of the men.) The course of the reaction times through the eight repetitions is much changed, *and*: the curve of the dementia præcox men corresponds closer to that of the normal women, that of the dementia præcox women to the normal men. Further, a similar series of experiments with six women subjects, *by a woman experimenter*, gave now a result similar to the previous one of the man experimenter with the men dementia præcox subjects. Other results point in the same direction; *e. g.*, the number of *Komplexmerkmale*, while as previously more frequent in the women throughout (and in both much increased), shows in the curve of decrease rather the reversed relationship of the men and women subjects from that found in the normal. Again the woman experimenter finds with women dementia præcox subjects the same result as the man experimenter with the men dementia præcox subjects. These seem very suggestive findings. The responses are changed much more frequently in the dementia præcox than in the normal subjects; the sex relationship is indeterminate and is not altered in the time relations of the changed and unchanged responses.

The second paper deals with normal subjects only, adding some material on the psychogalvanic reflex. This is from some early work by Jung and Brill, with a very simple technique. Association series of the same 50 or 25 stimulus words were given respectively 6 times weekly and 7 times daily to groups of 4 and 5 subjects. A heightened reaction time in the fourth experiment, noted in Pfenninger's men subjects, is seen here also, and a corresponding phenomenon appears again in the galvanic reactions; the authors talk of homosexual resistances. As with Pfenninger the number of changed responses decreases with repetition, and there is less change in the daily series than in the weekly. Changed responses have longer times, and are more associated with *Komplexmerkmale* than unchanged ones, as we should expect. Also the galvanic reactions show, in their relation to these phenomena, about what our knowledge of this method would lead us to anticipate. The deflections tend to drop in the later series, though not always in correspondence with the association time. Deflections above the median are also associated with greater change in response than those below it; in a greater degree than the change is related to the remaining *Komplexmerkmale*.

The reviewer, and doubtless others, have noted the possibility of associative responses being influenced by the personality of the experimenter.¹ The result of Morawitz's contribution to Pfenninger's article is in conformity with this idea, and Aptekmann tests it out somewhat further. Experiments were made by Jung and the author, with six men and six women subjects. The differences are often too small for significance, but in a special experimental series the women subjects show a rather constant deflection with the woman experimenter, much greater and decreasing deflections with the man experimenter. The men subjects show with the man experimenter about the same result as the women, with the woman experimenter much smaller deflections, slightly decreasing. Beyond the general decrease with repetition there is nothing of certain significance in the association times. Detailed examination seems to the author to reflect the greater prominence of sexual factors in the experiment with opposite sex, of the economic one in the others. The two sets were not with the same stimulus words. Words which begin with a high deflection tend to preserve this superiority in repetition. Differences may be shown in the personal influence of various experimenters on the results. The author considers that in the present instance other factors outweigh the sex difference; the point is well taken that the experiment here becomes a measure of the experimenter as well as the subject.

Dealing with the responses by classification in quasi-logical categories seems to have been abandoned by Jung's pupils. This method is essentially a criterion of personal association type, and in Pfenninger's problem would not have made so much difference; but something of the sort should probably have been attempted in Aptekmann's research, with a simplification of the original Jung-Riklin categories. That no generalizations on the effect of sex differences in the experimenter should be made on the basis of one experimenter of each sex, seems as clear to the author as to the reviewer.

A broader criticism to be made of these two papers is one that applies to much of the work from their common source. There seems to be no adequate conception of the significance of variability. In a school that makes so much of individual psychology, it is the more regrettable that individual differences should be all but ignored in a study whose material must contain much of value for their understanding. The authors like to deal with their averages without statement of deviations as though every member of the group had shown

¹ *PSYCH. REV.*, 1911, 18, 6-7. *PSYCHOL. MONOG.*, 1911, 13, No. 57, p. 79.

the same measure. As a result, it often happens that the authors strain every neurofibril for the uniform psychological interpretation of some phenomenon whose factual validity is far from established in the given results. Psychoanalysis has an excellent *Problemstellung* but its methods as yet lack sense of proportion; psychoanalysts seek the road to knowledge with a good compass, but an execrable map.

While then it seems very plain that the presentation of the results could have been improved upon, experimental practice in psychoanalytic envisagement should be in every way encouraged, that the more doubtful theories associated with the method may be submitted to proper objective test.

F. L. WELLS

MCLEAN HOSPITAL

A CORRECTION

TO THE EDITOR OF THE PSYCHOLOGICAL BULLETIN:

Mr. F. S. Breed has called to my attention the fact that a criticism suggested in my review of his monograph, "The Development of Certain Instincts and Habits in Chicks" (see the August number of the BULLETIN), was forestalled by him in the work reviewed. I suggested that in the experiments which he describes, where a chick rejected blue when that color was offered with black and also when it was offered with white, there might have been identification of the absolute brightness of the blue, which would thus have been seen not as a color but as a grey. Mr. Breed however says on page 69: "It may be suggested that after the long period of training the chicks respond to a particular brightness value, the blue amounting to certain degree of grey. But No. 32 and No. 33 rejected blue (tint No. 1) when it was used in combination with the much brighter yellow." I am glad to take this opportunity of apologizing for the carelessness shown in overlooking the fact that more than one saturation grade of blue was used in these experiments, a fact which decidedly strengthens the case for color discrimination.

MARGARET FLOY WASHBURN

VASSAR COLLEGE

BOOKS RECEIVED DURING OCTOBER

- LEUBA, J. H. *A Psychological Study of Religion*. New York: Macmillan, 1912. Pp. xiv+371. \$2.
- WATSON, J. *The Interpretation of Religious Experience*. 2 vols. Glasgow: Maclehose & Sons, 1912. Pp. xiv+375, x+342. \$6.
- MORGAN, C. L. *Instinct and Experience*. New York: Macmillan, 1912. Pp. xvii+299. \$1.25.
- HÖFFDING, H. *A Brief History of Modern Philosophy*. (Trans. fr. German by SANDERS, C. F.) New York: Macmillan, 1912. Pp. x+324. \$1.25.
- CALKINS, M. W. *A First Book in Psychology*. (3d rev. ed.) New York: Macmillan, 1912. Pp. xix+426. \$1.90.
- CALKINS, M. W. *The Persistent Problems of Philosophy*. (3d rev. edition.) New York: Macmillan, 1912. Pp. xxvi+577. \$2.50.
- HELLER, T. *Grundriss der Heilpädagogik*. (2. umgearb. u verm. Aufl.) Leipzig: Engelmann, 1912. Pp. xi+676. Mk. 17, Geb. 18.
- ELSENHANS, T. *Lehrbuch der Psychologie*. Tübingen: Mohr (Paul Siebeck), 1912. Pp. xxiii+434. Mk. 15.
- POFFENBERGER, A. T. *Reaction Time to Retinal Stimulation, with Special Reference to the Time Lost in Conduction through Nerve Centers*. (No. 23 of Archives of Psychology.) New York: The Science Press, 1912. Pp. iii+73.
- CULLER, A. J. *Interference and Adaptability. An Experimental Study of their Relation, with Special Reference to Individual Differences*. (No. 24 of Archives of Psychology.) New York: The Science Press, 1912. Pp. v+80.
- TODD, J. W. *Reaction to Multiple Stimuli*. (No. 25 of Archives of Psychology.) New York: The Science Press, 1912. Pp. iii+65.
- MARTIN, L. J. *Die Projektionsmethode und die Lokalisation visueller und anderer Vorstellungsbilder*. Leipzig: Barth, 1912. Pp. 231.

NOTES AND NEWS

DR. E. B. TITCHENER, Sage professor of psychology in the Graduate School of Cornell University, has been appointed head of the combined undergraduate and graduate sections of the department of psychology and lecturer in psychology in the College of Arts and Sciences. In the latter position Professor Titchener will give lectures in elementary psychology. In connection with the changes mentioned it is significant to note the retention of the professorship in the Graduate School.

SAMUEL W. FERNBERGER, PH.D. (Pennsylvania), succeeds Dr. Harry P. Weld as instructor in experimental psychology at Clark University.

T. H. HAINES, professor of psychology in the Ohio State University, is on leave of absence for the present year. Professor Haines plans to spend the year in visiting a number of European psychopathological institutes.

DR. C. E. FERREE, of Bryn Mawr College, has been advanced to an associate professorship of experimental psychology. A separate building has been granted him by the College to be used exclusively as a graduate laboratory of experimental psychology. This building will be fitted up for research work alone and will, when finished, consist of eight rooms. One or more optics rooms will be provided, furnished with sky-lights, diffusion sashes, etc., for the control of illumination, and with concrete piers running to the ground to give a vibrationless support for delicate apparatus. The regular services of a mechanic will be available for this laboratory.

PROFESSOR E. A. KIRKPATRICK, of the State Normal School, Fitchburg, Massachusetts, would be glad to receive letters from all those who would care to have a series of photographs, similar to those issued by the Open Court Publishing Company, of present-day psychologists, educators, and men of science. Suggestions concerning the photographs which should be placed in such a collection would be welcomed by him, and the amount of interest in the matter indicated by the communications received will determine whether it is feasible to undertake the task of collecting and publishing.

THE
PSYCHOLOGICAL BULLETIN

VALUATION AS A SOCIAL PROCESS

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In a large view of the matter valuation is nothing less than the selective process in the mental-social life of man: all values are in some sense survival values and have a bearing on the onward tendency of things. They indicate significance with reference to some sort of a crisis, and are factors in guiding the behavior of some sort of organism. The idea might easily be extended to lower forms of life and made to embrace all the psychical aspects of selection; we shall be content, however, to consider some of its human applications.

The manner in which a certain object develops value for a man in a particular situation is a matter of the commonest experience: at every instant we are passing from one situation to another and the objects about us are taking on new values accordingly. If I wish to drive a nail I look at everything within reach with reference to its hammer-value, and if the monkey-wrench has more of this than any other object available I reach for it, its function increases, it survives, it is the fit, is a growing factor in life. And men, nations, doctrines, what you will, wax and wane by analogous acts of selection.

The essential things in the conception of value are, then, a human organism (not necessarily a person) a situation and an object; the last having properties that have an influence on the behavior of the organism in view of the situation. The organism is, of course, the heart of the whole matter. We are interested primarily in that because it is a system of life, and in values because they mould its growth. The various values acting on the organism are ever being integrated by the latter (as by a man when he "makes up his mind") and the situation is met by an act of selection, which is a step in growth, leading on to new situations and values.

Valuation includes the history that lies back of values, that antecedent process of growth and struggle by which any object of thought or sentiment comes to have more or less power over choice and action. If, for example, diamonds, the paintings of Corot, the dogmas of Christian Science, the idea of brotherhood, the attainment of the South Pole, the services of a physician, have power, in various ways and degrees, over human behavior, it is because there has been a previous mental and social process out of which these objects have emerged with a certain weight for certain mental situations.

The organism which the idea of value implies, the life which is the heart of the process, about which values center may be personal or it may be impersonal: a doctrine, an institution, a movement, anything which lives and grows, gives rise to a special system of values having reference to that growth, and these values are real powers in life whether persons are aware of or interested in them or not; the growth of language, for example, of myth, of forms of art, works on to important issues with little or no conscious participation on our part. In general there are as many centers of value as there are phases of life.

The various classifications of value are based in one way or another on that of the objects, organisms or situations which the general idea of value involves. Thus, taking the point of view of the object, we speak of grain-values, stock-values, the values of books, of pictures, of doctrines, of men. Evidently, however, these are indeterminate unless we bring in the organism and the situation to define them. A book has various kinds of value, as literary and pecuniary, and these again may be different for different persons or groups.

As regards the forms of human life to which values are to be referred, it seems to me of primary importance to make a distinction which I will call that between human-nature values and institutional values.

The first are those which may be traced without great difficulty to phases of universal human nature. The organism for which they have weight is simply man in those comparatively permanent aspects which we are accustomed to speak of as human nature, and to contrast with the shifting institutions that are built upon it. The objects possessing such values differ greatly from age to age, but the tests which are applied to them are fundamentally much the same, because the organism from which they spring is much the same. A bright color, a harmonious sound, have a value for all men, and we may reckon all the more universal forms of beauty, those which

men of any age and culture may appreciate through merely becoming familiar with them, as human-nature values. Such values are as various as human nature itself and may be differentiated and classified in a hundred ways. There are some in which particular senses are the conspicuous factors, as auditory and gustatory values. Others spring from the social sentiments, like the values of social self-feeling which underlie conformity, and the values of love, fear, ambition, honor and loyalty. Closely related to these are the more universal religious and moral values, which, however, are usually entangled with institutional values of a more transient and special character. The same may be said of scientific, philosophical and ethical values, and great achievement in any of these fields depends mainly on the creation of values which are such for human nature, and not merely for some transient institutional point of view.

The second sort of values are those which must be ascribed to an institutional system of some sort. Human nature enters into them but is so transformed in its operation by the system that we regard the latter as their source, and are justified in doing so by the fact that social organisms have a growth and values that cannot, practically, be explained from the standpoint of general human nature. The distinction is obvious enough if we take a clear instance of it, like the distinction between religious and ecclesiastical values. Such general traits of religious psychology as are treated in William James's *Varieties of Religious Experience*, correspond to values that we may call values of human nature; the values established in the Roman Catholic Church are a very different matter, though human nature certainly enters into them. In the same way there are special values for every sort of institutional development—legal values, political values, military values, university values, and so on. All technical values come under this head. Thus in every art there are not only human-nature values in the shape of phases of beauty open to men at large, but technical values, springing from the special history and methods of the art, which only the expert can appreciate.

Pecuniary values should, I think, be reckoned in this second class, for reasons which I shall not attempt to give at present.

This distinction, as I have remarked, rests upon the fact that there are forms of social life having a distinct organic growth, involving distinct needs and values, which cannot be understood by direct reference to universal human nature and the conditions that immediately influence it. I am aware that it may be difficult to apply to particular cases. It resembles most psychological distinctions in

offering no sharp dividing line, being simply a question of the amount and definiteness of social tradition and structure involved. All human values are more or less mediated by transient social conditions: they might, perhaps, be arranged in a scale as to the degree in which they are so mediated; some, like the taste for salt, comparatively little, others, like the taste for poetry, a great deal. In dealing with the latter kind we come to a point on the scale where the social antecedents take on such definite form and development as to constitute a distinct organism which must be studied as such before we can understand the value situation. In moral values, for example, there are some, like those of loyalty, kindness and courage, which spring quite directly from universal conditions and may be regarded as human-nature values; others, like the obligation to go to church on Sunday, are evidently institutional. I need hardly add that human and institutional values often conflict, or that reform consists largely in readjusting them to each other. Nor need I discuss in detail the familiar process by which human-nature values, seeking realization through a complex social system, are led to take on organization and an institutional character which carries them far away from human-nature and in time calls for a reassertion of the latter; or just how this reassertion takes place on the initiative of individuals and small groups. Any one may see such cycles in the history of the Christian church, or of any other institution he may prefer to study.

It is noteworthy, also, that there are words that may be understood in either a human-nature or an institutional sense, and so are ambiguous with reference to this distinction. For example educational value might be a real human value, or it might refer to tests of a special and technical sort, and "religious" often means ecclesiastical.

The various human-nature and institutional values of a given object differ among themselves as the phases of the human mind itself differ: that is, however marked the differences, the values are after all expressions of a common organic life. There is no clean-cut separation among them and at times they merge indistinguishably one into another. An organic mental-social life has for one of its phases an organic system of values. For example the æsthetic and moral values may seem quite unconnected, as in the case of a man with a "fair outside" but a bad character, and yet we feel that there is something beautiful about perfect goodness and something good about perfect beauty. It is agreed, I believe, that the best literature and art are moral, not, perhaps, by intention, but because the two

kinds of value are related and tend to coincide in their completeness. Alongside of these we may put truth-value, and say of the three that they are phases of the highest form of human judgment which often become indistinguishable.

The institutional values are also parts of the same mental-social system, distinguished by their derivation from a special social organism. They merge into the human-nature values, as I have suggested, and unless the two are in opposition it may be hard to distinguish between them. An institution, however, seldom or never corresponds so closely to a phase of human nature that the institutional values and the immediately human values on the whole coincide. An idea, in becoming institutional, merges itself with the whole traditional structure of society, taking the past upon its shoulders, and loses much of the breadth and spontaneity of our more immediate life. There are no institutions that express adequately the inner need for beauty, truth, righteousness and religion as human nature requires them at a given time: no church, for example, ever was or can be wholly christian.

It is apparent that the same object may have many kinds of value, perhaps all of those that I have mentioned. It is conceivable that man may turn all phases of his life towards any object and appraise it differently for each phase. Consider, for instance, an animal like the ox, of immemorial interest to the human race. It may be regarded as beautiful or ugly, may arouse the various emotions, as love, fear or anger, may give rise to moral and philosophical questions, may be the object of religious feeling, as in India, and have a value for the senses of sight, hearing, touch, smell and taste. It has also, especially among the pastoral peoples, notable institutional values; plays a large part in law, ceremony and worship, and, in our own tradition, has an eponymous relation to pecuniary institutions.

Since values are a phase of the public mind, of the same general nature as public opinion; they vary as that does with the time, the group and the special situation. Every nation or epoch has its more or less peculiar value system, made up of related parts: any one can see that the values of the Middle Ages were very different from our own: they are a part of the *ethos*, the *mores*, or whatever you choose to call the collective state of mind.¹ Each individual, also, has a system of values of his own which is a differentiated member of the

¹The human-nature values, of course, vary much less than the institutional values. Thus fashions vary infinitely, but conformity, the human nature basis of allegiance to fashion, remains much the same.

system of the group. And these various group and individual aspects hang together in such a way that no one aspect can be explained except by reference to the whole out of which it grows. You can hardly understand how a man feels about religion, for example, unless you understand also how he feels about his industrial position and about other matters in which he is deeply concerned; you must, so far as may be, grasp his life as a whole. And you will hardly do this unless you grasp also the social medium in which he lives. Any searching study of any sort of values must be the study of an organic social life.

The process that generates value is mental but not ordinarily conscious; it works by suggestion, influence and the competition and survival of ideas; but all this is constantly going on in and through us without our knowing it. I may be wholly unaware of the genesis or even the existence of values which live in my mind and guide my daily course: indeed this is rather the rule than the exception. The common phrase "I have come to feel differently about it" expresses well enough the way in which values usually change. The psychology of the matter is intricate, involving the influence of repetition, of subtle associations of ideas, of the prestige of personalities, giving weight to their example, and the like; but of all this we commonly know nothing. The idea of punishment after death, for example, has been fading for a generation past; its value for conduct has mostly gone; yet few have been aware of its passing and fewer still can tell how this has come about. This trait of the growth of values is of course well understood in the art of advertising, which aims, first of all, to give an idea weight in the subconscious processes, to familiarize it by repetition, to accredit it by pleasing or imposing associations, to insinuate it somehow into the current of thought without giving choice a chance to pass upon it at all.

If the simpler phases of valuation, those that relate to the personal aims of the individual, are usually subconscious, much more is this true of the larger phases which relate to the development of complex impersonal wholes. It is quite true that there are "great social values whose motivating power directs the activities of nations, of great industries, of literary and artistic 'schools,' of churches and other social organizations, as well as the daily lives of every man and woman—impelling them in paths which no individual man foresaw or purposed."¹ Nor is there anything mysterious about this: it is simply one aspect of the fact that the activities, even the existence,

¹ B. M. Anderson, Jr., *Social Value*, p. 116.

of the forms of social life are not necessarily or usually objects of consciousness to those involved in them. Every one must see that this is true as regards the past, and there is no reason to suppose that the present is different. Without doubt we are taking part in institutional movements of which we know nothing, and which remain for the future historian or sociologists to discover, just as the organic growth of language, of myth and the like, which went on in the minds of our remote predecessors, has been brought to light by the philologists and ethnologists of our own day. Most of the difficulty that we have in understanding statements of the sort just quoted arises from our not having assimilated fully the modern discovery that reflective consciousness embraces only a small part of life.

Values imply an act of selection, which may also be unconscious as well as conscious. Selection is the critical activity in which the organism turns one way or another under the pull of values; but we often do not know that, as individuals, we are in such a crisis, and still less do we know it for the groups and institutions of which we are a part. And while values may be altered more or less in the crisis—nothing stands still—they yet exist antecedently to it, very much as the military power of a nation exists before it is tested in war, or the “strength” of a presidential candidate before the campaign opens.

Like all phases of the human mind valuation may be regarded either in the individual or in the collective, or public, aspect; these two, of course, being aspects merely, which all phases of value, human-nature or institutional, present. Public valuation is the process viewed in a large way, as it goes on in the general mind, in its actual complexity of growth. In studying it one looks for broad features, with no special regard to persons. Private valuation is the same thing observed working itself out in the individual mind; it is a particular phase of the collective process that for various reasons may have an interest of its own. The distinction is the same as that between public and private opinion, the one being a collective, the other a particular view of a common whole.

Of these phases public valuation is for many purposes the more important. It is the real thing, the big thing, in which other phases of value find their relation and significance. In the widest sense it embraces the genesis, competition and organization of particular values; you aim to see the value movement as a living and various whole, of which all particular values and kinds of value are members. It is a real drama, with continual conflicts, crises and dénouements.

It may be too large to grasp satisfactorily, but at least we should recognize that nothing less affords an adequate basis for understanding the past or predicting the future. If we consider the valuation of particular objects of any sort, such as, let us say, the program of socialism, the works of Bernard Shaw, or Mr. Roosevelt's leadership; or of such staples of the stock market as wheat or New York Central shares; we may see that the position of these objects can be understood only with reference to the larger drama of valuation in which they have their parts: particular prices and judgments are not enough, we must see the interworking and tendency of the whole. "The play's the thing" and the function of the object in the play.

Next to this, if we must be content with a cross section, is the dynamic situation, the state of the play at a given time, made up of many coöperating and conflicting factors from the interworking of which the future must emerge.

I suppose, for example, that it is the ability to grasp the course or state of value in this large way that distinguishes the financier from the mere speculator, the statesman from the mere politician, or the competent critic of literature or art from the mere reviewer. Indeed it is apt to be what distinguishes the capable man from the incapable in any field. It may be said in general that the power to grasp process, to see the drama of values, is the height of the practical. It is what we all have to do in the real work of life, and the man who can do it has breadth, caliber, general capacity, can take responsibility, and does not require some one else to show him what to do.

Private valuation is a particular phase of public valuation, and one cannot be understood without the other. The individual in forming his special estimates, no matter how peculiar they may be, is working with material he gets from others—suggestions and impressions that come from the mental currents of his time and from the general stream of history. This material he works up in his own way, always at least a little different from that of any one else and sometimes a great deal. In proportion to the importance of these differences he exerts a special influence upon values in the general movement of thought. The tendency to ignore exceptional individuals, and consider only groups, is a serious error. The non-conformer, though he stand alone, is often the most significant fact in the situation, and may prove to be that one who, with God, is a majority.

Private valuation, then, stands in no opposition to public valuation; it is, even in the extremes of non-conformity, a phase of the

same process. The idea of an essential opposition between the two can arise only when public valuation is, wrongly, identified with value conventions or institutions. With these private valuation may easily be at variance.

Of course this large view of the process, which I call public valuation, should by no means be confused with institutional valuation. The latter is that part of the process whose explanation must be sought in those special tendencies of institutional life which often depart so widely from the simpler workings of human nature. Institutional valuation has its public and individual aspects like any other social phenomenon. The good churchman, in expressing the views of the church, may be expressing himself as truly as he does the institution; but it may be that his self is so institutionized as not to express human nature.

It is not uncommon, however, to think of public value, or, as it is usually called, social value,¹ as that which is fixed by some institution, or other formal process. There is something in this left over from those mechanical theories of society that could not see any unity in human life except this unity took a mechanical form—a contract, a creed, a government, or the like. The public or social must, then, be the institutional, the conventional, and this was set over against the individual, who was thought of as becoming social only by some such combination. I trust that I need not linger to refute this outworn idea.

The institutions, we may note in this connection, usually have rather definite and precise methods for the appraisal of values in accordance with their own organic needs. In the state, for example, we have ancient institutions of choice, which include elaborate methods of electing or appointing persons, as well as legislative, judicial and scientific authorities for passing upon ideas. The church has its tests of membership, its creeds, scriptures, sacraments, penances, hierarchy of saints and dignitaries, and the like, all of which serve as standards of value. The army has an analogous system. On the institutional side of art we have exhibitions with medals, prize competitions, election to academies and the verdict of trained critics: in science much the same, with more emphasis on titles and academic chairs. You will find something of the same sort in every well organized traditional structure. We have it in the universities, not

¹ I prefer the former term in such connections because the use of "social" to denote collective aspects, in antithesis to "individual," perpetuates the traditional fallacy that the individual is not social.

only in the official working of the institution, but in the fraternities, athletic associations and the like.

It is also noteworthy that institutional valuation is nearly always the function of a special class. This is obviously the case with the institutions mentioned, and it is equally true, though perhaps less obviously, with pecuniary valuation.

The application of these principles to the latter I hope to take up upon another occasion.¹

¹A paper dealing with some phases of pecuniary valuation will appear in the *American Journal of Sociology* for January, 1913.

GENERAL REVIEWS AND SUMMARIES

CRIMINAL PSYCHOLOGY

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Dr. Wilhelm Stekel (5) makes an interpretation, truly Freudian in character, of the thefts of kleptomania as symbolisms of suppressed sexual acts. Mr. Albrecht (5) in a note says that "it is our firm conviction that criminal psychology may obtain from Freud's discoveries the most stimulating suggestions, and we hope that his theories and conclusions will be received with less prejudice here in America than they have encountered in Europe." Evidently his wishes are being gratified, although a few at least of the more careful psychologists and psychiatrists, are evincing a little of the wiser European conservatism toward the Freudian theories.

Doubtless there may be something of sexual symbolism in some of the abnormal acts of some of the psychoses, but to go to the extremes to which the writer in question goes seems absurd. To find in sexual symbolism the explanation for each and every psychosis indicates a psychological fanaticism that might well itself be looked upon as symbolic of a perverted sexual basis.

Those who read the above paper and also read "Berufswahl und Kriminalität" (6) will no doubt be willing to agree that Dr. Stekel is an extremist. In this article he maintains that the final psychosis of a neurotic individual is brought about by his struggle to suppress his inherent tendencies to crime. His theory of universal criminality among children and the relation of pseudo-epilepsy to crime are suggestive of Lombroso, although they lack the carefully worked out support that characterizes the theories of the latter.

The real thesis of the paper relates to the influence which criminal tendencies have upon the choice of a profession. The main influences, aside from paternal, which affect one in choosing a profession are held to be the desire to suppress, to give vent to, or to seek protection from criminal tendencies.

In a very few pages and with the citation of only three cases Wm. Healy (2) sets forth more clearly and concisely than others have done in several times the space, the essential psychological nature of

crime and the necessity of the application of the genetic method to each individual case. The differential results found by this method should be followed by differential treatment. He recognizes, with others, that a large per cent. of recidivism has its basis in feeble-mindedness, epilepsy, and insanity. Yet it is refreshing to find that he asserts that "no one germ will be found eating out the moral nature."

Dr. Bernard Glueck (1) by means of a thorough study of five cases that came under his observation in the criminal department of the Government Hospital for the Insane shows the existence of what he considers to be a born criminal type. This type is based on a defective mentality, an unstable nervous disposition of an hereditary character. He further believes that "the incorrigible criminal is sufficiently characterized by such unmistakable features (as) would enable us to recognize him when we see him, and thus justify his permanent isolation from the community." Of particular significance is the relation between the criminality and the insanity of these people.

"The same degenerative soil which makes the development of the psychosis possible in the one case, expresses itself in crime in another instance. The factors which determine whether the one or the other phase will manifest itself, depend entirely upon environmental conditions, and are accidental in nature. The stresses which these defective individuals meet with in freedom need not have such a strong influence upon them as to produce a psychosis. The want of moral attributes makes it possible for them readily to surmount many difficulties by means of some criminal act, difficulties, which in a normal person, would require extraordinary effort to remove. When placed, however, under the stress of imprisonment where they can neither slip away from under the oppressive situation, nor square themselves with it by some criminal act, the organism becomes affected to such a degree that the development of a psychosis is greatly facilitated. The character of the delusional fabric of these individuals is such that one can easily find a ready and more or less correct explanation for it. It is chiefly a compensatory reaction in an endeavor to make a certain unpleasant situation acceptable."

The strength of the position taken in this article is increased if we discuss in connection with it two other papers. In "The 'Imprisonment Psychosis,'" by Dr. W. W. Richardson (4), we have a description of cases that very closely simulate those cited by Dr. Glueck—cases with a defective, unstable basis which develop criminal

acts, and later upon incarceration, the psychosis. Dr. Richardson and the authorities quoted by him agree that the psychosis is brought on by the bringing of an unstable, defective character into conflict with the restrictions of prison discipline.

The conclusions of Dr. Richards' article (3) also lend support to those of Dr. Glueck. A comparison of facts in the United States with those in France and Germany seems to show that in all these countries a considerable number of the military offenses are committed by the insane, and that the insanity has been brought on by inability to withstand the strict military discipline. Dr. Richards states that a large per cent. of these cases recover (57 per cent. in the experience of the Government Hospital for the Insane).

In the study of the "imprisonment psychosis" and in that of the insane military offenders the majority of the cases seem to be due to dementia præcox, while Dr. Glueck maintains that his cases were not of this nature. Yet the results of each of these three studies agree in this: that a defective, deficient, or neurotic temperament unable to undergo the restrictions of society results in crime; unable to bear up under a more rigorous restriction (prison or army discipline), it results in a psychosis. Under the more favorable hospital environment it tends to recover *its* normal, though not *the* normal condition.

The further fact brought out by these writers, that this unstable class of people tend to be recidivists adds weight to Dr. Glueck's plea for a permanent segregation of the class.

REFERENCES

1. GLUECK, B. A Contribution to the Catamnestic Study of the Juvenile Offender. *Amer. J. of Crim. Law and Criminol.*, 1912, 3, 220-244.
2. HEALY, WM. The Problem of Causation of Criminality. *Amer. J. of Crim. Law and Criminol.*, 1912, 2, 849-857.
3. RICHARDS, R. L. A Study of Military Offences Committed by the Insane in the United States Army, for the Past Fifty Years. *Amer. J. of Insanity*, 1911, 68, 279-291.
4. RICHARDSON, W. W. The "Imprisonment Psychosis." *Amer. J. of Insanity*, 1912, 68, 473-483.
5. STEKEL, W. The Sexual Root of Kleptomania. (An abridgment by Adalbert Albrecht.) *Amer. J. of Crim. Law and Criminol.*, 1911, 2, 239-246.
6. STEKEL, W. Berufswahl und Kriminalität. *Arch. für Kriminal Anthr. und Kriminalistik*, 1911, 40, 268-280.

SPECIAL REVIEWS

ANTHROPOLOGY AND SOCIAL PSYCHOLOGY

Totemism, An Analytical Study. A. A. GOLDENWEISER. J. of Amer. Folk-Lore, 1910, 23, 179-293. (Reprint. Pp. 115.)

Most theoretical works on totemism are of a constructive or synthetic character, seeking to find the essence of the phenomenon in one or more basic sociological or psychological features, and then superadding other features as necessary or typical correlates in a coherent system of belief and practice that presents uniform or parallel characteristics wherever found. Goldenweiser's paper differs fundamentally in method from these, as its subtitle indicates. Its main purpose is to analyze out the various ethnological elements that form part of any given totemic system, to investigate the claims of each as a necessary feature of totemism, and to discover the most generalized psychological definition applicable to all its forms. In this way a new and independent standpoint is gained for the understanding of the mechanism of totemism.

In the introduction (pp. 1-5) the author deals with the definitions of totemism that have been given by three well-known English anthropologists, Frazer, Haddon and Rivers. It should be noted that Goldenweiser is not primarily concerned with a balanced review of prevalent theories of totemism and its origin, and hence refers to them only for illustrative purposes. It is the type of totemic theory exemplified by Frazer that he has chiefly in mind throughout the paper as opposed to his own standpoint, but issue is taken also with certain other writers on totemism, such as Lang, Major Powell, Hill-Tout, and Father Schmidt. As a result of his brief review of the definitions of totemism given by Frazer, Haddon and Rivers, Goldenweiser finds that there are chiefly five types of belief and custom that form elements of totemic systems as ordinarily defined. These are clan exogamy, totemic names of clans, a religious attitude toward the totem (an animal, plant or inanimate object serving as the protector or crest of the clan), taboos (generally of eating and killing) in regard to the totem, and belief in descent from the totem. As the author pertinently remarks, "The justification of regarding the various features of totemism as organically interrelated is not *a priori*

obvious." And the whole trend of Goldenweiser's argument is to the effect that they are not thus "organically interrelated" in origin or by a uniformly operative process of evolution, but have become so in whole or in part, and often with still other features not generally considered of such fundamental importance, by various processes of secondary association.

The major part of the paper is taken up with a survey, first, of the totemic features found in two areas in which totemism is characteristically developed—Australia and the northwest coast of America (pp. 5-52); secondly, of the general occurrence in different parts of the world of ethnological features, believed to be symptomatic of totemism, divorced from any totemic setting, and, conversely, of the frequent non-occurrence of one or more of the features in cases where one can nevertheless justly speak of a totemic society (pp. 53-86). A careful comparison of the two regions selected, as a test example, for relatively detailed treatment shows certain analogies and, on the other hand, several fundamental differences. The results of the comparison are summarized in tabular form (p. 51). We find that in both western British Columbia and Central Australia, exogamy, that is, the prohibition of intermarriage among the members of a social unit, is found, with this important difference, however, that while among the Indians of the north Pacific coast (Tlingit, Haida, Tsimshian, northern Kwakiutl) the totemic social units (phratries or clans) are exogamous as such, among the natives of Australia it is the larger non-totemic social units (phratries, otherwise known as "moieties," and marriage classes) that as a rule regulate exogamy, the totemic clans being in most cases exogamous only by virtue of their being phratric subdivisions. Moreover, the totemic social units of both areas bear totemic names, though the Australian clans are more consistent in this respect than the tribes of British Columbia. Of the four Tsimshian clans or phratries (sociological nomenclature is in somewhat of a muddle in West Coast ethnology) only two have names referring to their animal totems or crests (wolf and eagle); the phratric subdivisions (Tlingit clans and Haida "families"), while possessing their distinctive crests, have names of a local character, thus pointing to the inference that they are social units originally confined each to a single village; furthermore, the Eagle clan (probably better called phratry) of the Haida is just as often termed *Gitins*, a name of no ascertainable totemic significance. I am inclined to think that Goldenweiser makes too much of this relative lack of totemic names in British Columbia as a point of difference between

the two regions compared. The essential fact is the existence of crests associated with definite social units (phratries and clans), which may well be compared with the Australian totems that are associated with clans; the mere matter of whether or not the names of the totemic social units have distinct reference to the totems is, where the phratric or clan totems or crests themselves stand out clearly, of distinctly secondary importance.

Right here a more serious criticism must be made. For one who aims to be rigidly analytical in method, Goldenweiser does not carry his analysis far enough. The concept "an exogamous totemic clan" involves three distinct sociological concepts—the clan, the totem or crest, and the practice of exogamy. These are mutually independent concepts. Now the clan or other subtribal social unit is of such wide occurrence and is so much a matter of course as a starting point for a totemic society, that there is perhaps no need to isolate the phenomenon of a grouping into clans as one of the symptoms of totemism, though it might have been useful to entertain for a moment the possibility of totemic features becoming associated with a tribe or other undivided social unit as such. Be this as it may, it is clear that the concept of the totem, including that of crest or badge, as associated with the clan, should be analyzed out as one of the symptoms of totemism. Strange to say, Goldenweiser has not definitely done this, but has tacitly subsumed the notion under the concepts of exogamy of totemic social units and totemic naming. This seems unjustifiable, for Goldenweiser shows clearly that the clan totem as such can subsist without either exogamy, totemic naming, or, it may be added, worship of or other religious attitude toward the totem (see pp. 82–86). It may be objected that if we eliminate from a totemic system the totemic name, the taboo against eating, killing or acting in some other specific way toward the totem, the belief in descent from or other form of kinship with it, and a religious regard therefor, there is no totem left wherewith to totemize. The phenomenon of experience, divested of all its sense attributes, has evaporated into a metaphysical "Ding an sich." This objection is not valid. It happens not infrequently that a social unit is associated with an animal, plant or inanimate object merely as a crest or emblem, often guarding the right to display or represent it in some way or other. The totem is in such cases seen in its most simplified form, as a communal badge or heraldic symbol, or, again, it may be merely referred to in a legend. It should be noted in passing that the active association of art and totemism, on which Goldenweiser justly lays

stress, is not to be confounded, though it may be intimately connected, with the heraldic aspect of totemism. In British Columbia in particular, where the totem often tends to become a mere crest, it would have been quite in place to isolate the clan totem (crest) as such as one of the elements of totemism.

The further comparison given by the author of Australian and West Coast totemism discloses instructive differences. Taboos, particularly of eating and killing, are common enough in both areas, but while both totemic and non-totemic taboos are found in Australia, they are never associated in British Columbia with totems as such. In central Australia the belief in descent of the clansmen from the totem has taken firm hold, whereas it is but imperfectly developed among the natives of the Pacific coast, being absent among the northern tribes (Tlingit, Haida, Tsimshian) and occurring to a limited extent among the Kwakiutl. In Australia magical ceremonies for the increase of the food supply and the belief in reincarnation of mythical ancestors are intimately connected with the totemic system; in British Columbia, while both magical ceremonies and belief in reincarnation are found, they are not in any way brought into relation with the totemic social organization. On the other hand, while the practice of acquiring guardian spirits and its elaboration into a system of secret societies is bound up among the natives of the northwest coast of America with their system of crests, this is far from being the case in Australia, though the guardian spirit idea is not entirely absent in that continent. Furthermore, in western British Columbia it has left a deep impress upon the decorative art of the natives, and to some extent seems even to have been influenced in its development by that factor; in Australia, however, decorative art, which is far less highly developed than in British Columbia, is less apt to be involved in totemic ceremonies than in that region. The ranking of individuals and clans gives West Coast totemism a peculiar coloring of its own, this feature being entirely lacking in Australia. Finally, the number of totems found in any tribe of the West Coast is small, while an Australian tribe regularly comprises a very large number of totems. As a net result one certainly gets the feeling that the two totemic systems compared owe their undeniable points of similarity, coupled with other points of difference, to what has been termed convergent evolution, and that these totemic systems in themselves have arisen by a process of secondary association of ethnological elements of disparate nature and origin, rather than by one of an evolution of custom and belief,

with definitely determined sequences. It is the object of the latter part of the paper to heighten this feeling into assurance.

The pages devoted to exogamy and endogamy (pp. 53-73) are among the most interesting of the paper. Evidence is presented to show that clan exogamy frequently occurs unassociated with totemic features; further, that totemic clans need not be exogamous. It is made clear that clan exogamy is not the only type of group exogamy found among primitive peoples, but that we have also to deal with local exogamy, and kinship exogamy based on a classificatory system of relationships. Goldenweiser lays stress, and justly, on the importance and difficulty of determining, in cases of intercrossing or subdivision of social units, which of the units is inherently exogamous and which only secondarily so. Thus, a clan may be exogamous either by virtue of its own character as a social group, determining exogamous relations; or by virtue of its forming a part of a larger group of such character; or because it is localized in a village which is exogamous as such; or because all the members of the clan, according to a classificatory system of relationship, are held to be kin to one another, and thus debarred from intermarrying by the rule of kinship exogamy. Bearing these important distinctions in mind, Goldenweiser makes a good case for the view that the typical Australian totem clan is not a true exogamous unit, the rule of exogamy as such referring to the phratry or marriage class. To call a clan exogamous under such circumstances might be to commit a fallacy similar to that of describing New York State as a commonwealth forbidding slavery, when, as a matter of fact, this is already implied in the statement that it forms part of a larger commonwealth forbidding slavery.

As to the next totemic feature examined, that of totemic names (pp. 73-75), Goldenweiser gives a number of instances, besides those already adduced for British Columbia, of totem clans that do not bear the names of their totems, though the naming of a group from its totem is one of the "features" of totemism least often absent. Examples are then given to show that the totem is by no means always conceived of as the ancestor of the clansmen (pp. 75 and 76). The modest proportion of cases of taboo that are distinctly totemic in character is next indicated, while conversely it not infrequently happens that a totemic group observes no taboo in reference to its totem (pp. 76-80). The independence of the taboo as such of any necessary connection with totemism is conclusively demonstrated. Finally, in discussing the religious aspect of totemism (pp. 80-86), so

often believed to be the significant aspect of the problem, Goldenweiser shows, first, that the worship of plants and animals is a universal ethnological feature not at all necessarily connected with a totemic society; secondly, that the religious attitude toward the totem in a totemic society is often but weakly developed, at times even absent altogether. The religious side of totemism, even where present, never exhausts, and generally makes up but a small part of the total religious life of the totemic community. Thus the claims of totemism to be considered a distinct stage in the history of religion are disposed of without much difficulty.

The following pages of the paper (pp. 86-98), defining more sharply the character and genesis of the "totemic complex," sound the keynote of the study and form its most valuable and suggestive portion. Totemism is shown to consist not of one particular ethnological feature, or even of a combination of two or more such features, but might be understood as a process of intimate association of one or more of these with social units. Goldenweiser's own words are worth quoting here: "This association with social units is what constitutes the peculiarity of totemic combinations. Elements which are *per se* indifferent or vague in their social bearings (*i. e.*, as related to social units)—such as dances, songs, carvings, rituals, names, etc.—become associated with clearly defined social groups, and by virtue of such association themselves become transformed into social values not merely intensified in degree but definite and specific in character. The one obvious important means by which the association with definite social groups is accomplished is descent" (p. 93). In proceeding to define totemism Goldenweiser points out that a definition of the phenomenon which aims to be inclusive must exclude reference to the specific content of different totemic systems, must express the nature of totemism as a relation subsisting between ethnological elements rather than as their sum, and must exclude the notion of religion, for which he substitutes, as a more inclusive concept, "objects and symbols of emotional value." Owing to the fact that totemism is variable not only in place but in time, Goldenweiser thinks it necessary to describe it as an ever-changing process, rather than in purely descriptive terms as a static phenomenon. While it would be quite wrong to deny this dynamic element in totemism, one may reasonably doubt whether it would not have been better to neglect this aspect for the purpose of a definition. As Goldenweiser's definition now reads, "Totemism is the tendency of definite social units to become associated with objects and symbols

of emotional value" (p. 97), the emphasis seems somewhat misplaced, for all ethnological complexes, and, for that matter, all single elements of custom and belief, must be understood dynamically, that is, historically. In the definition as stated there is somewhat of a contrast implied, though only vaguely, between totemism as a dynamic phenomenon and other cultural phenomena, a contrast which naturally weakens rather than strengthens the emphasis on the historical method of ethnology that Goldenweiser has in mind. The revised, and, to my mind, more acceptable, definition would read: Totemism is the association of definite social units with objects and symbols of emotional value. The brief psychological definition given by Goldenweiser, "Totemism is the specific socialization of emotional values" (p. 97), while intelligible in the light of all that precedes it, is hardly serviceable as a definition aiming to stand on its own feet; the process of association, while implied in it, is not sufficiently emphasized.

In the final pages of the paper (pp. 98-110), on the whole its weakest portion, the methodology of current evolutionary theories of totemic origin is first illustrated, then unfavorably criticized. Goldenweiser takes issue with the assumption of a regular one-line evolution of the forms of totemic society. He points out that it is unwarranted to select one feature of totemism as the primary element historically of the whole complex, and to establish a natural sequence for the appearance of the other features as growing up out of the primary feature. Merely plausible or intelligible evolutionary theories of the origin and development of cultural phenomena can in this way be built up without end, and it is often difficult to choose among them. Plausibility as such, however, has no evidential value. Another fundamental error of the evolutionist school of anthropology is the failure to recognize the vast importance of borrowing and assimilation of cultural elements. Processes which in higher levels of culture are recognized without question are often tacitly ignored in the study of primitive society. The lack of documented history is too often, ostrich fashion, taken to mean the lack of history, and primitive customs are too often thought of as the psychologico-mechanical product of "primitive" modes of thought acted upon by alleged principles of social evolution. That a whole totemic complex may be due primarily to processes of borrowing and assimilation is shown by the totemism of the western Shuswap, Lillooet, Chilcotin, and Carrier (pp. 103-106), for among these Indians we can trace the profound totemic influence of the coast tribes. The method employed

by Goldenweiser in his study of totemism, the analysis of a cultural phenomenon into its elements and the historical interpretation of the phenomenon as an association, varying in character from place to place, of these elements, is the method so often insisted upon by Professor Franz Boas as that best fitted to give fruitful results in anthropological investigations. The insistence on the importance of mutual cultural influence of neighboring tribes is also one of the leading notes in the ethnological method of Boas and his school. The examples given by Goldenweiser of cultural borrowing in British Columbia in other phases than totemism serve to illustrate further his methodological standpoint.

One is at times disposed to complain of the rather small number of examples given or range of tribes covered for certain points, but it should be remembered that the study is in no sense a survey of totemistic fact, any more than, as we have seen, it is one of totemistic theories. Once and again a fact is not stated quite accurately (thus, p. 42, totem poles can hardly be said to be a striking feature of all or even most British Columbia villages), or is doubtfully pertinent to the argument (thus, p. 21, the restriction of whaling among the Nootka to certain families has nothing to do with taboo). These are but slight blemishes, however, that in no way seriously impair the value of the study. It is hardly too much to say that Goldenweiser's *Totemism* forms one of the most notable, perhaps the most notable, contribution to ethnological method yet produced by American anthropologists.

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Sociology in its Psychological Aspects. CHARLES A. ELLWOOD.
New York: D. Appleton & Co., 1912. Pp. xiv+417.

This clearly written work is perhaps the most explicit of any of our recent sociological texts in its recognition of psychology as fundamental. The author expresses his indebtedness to Professors Dewey and Mead for his point of view, and readers of the *BULLETIN* will not find it unfamiliar. But the theory takes on added definiteness and significance in its applications, and the book should make a valuable contribution toward the sociological method.

Functional psychology is interpreted first of all as implying "that consciousness does work, does function, and as such has a survival value in the life process." This is against a mechanistic

theory according to which the explanation of social phenomena is to be sought in physico-chemical processes, whereas consciousness is not a factor and performs no work in the social life. But, consciousness in its functioning is itself regular, and does its work within universal organic processes, especially the processes of habit and adaptation. This, as against an indeterministic point of view which would make consciousness a lawless factor.

Assuming then that consciousness does work, the key to its nature is to be found in the character of the life process in which it functions. The capital fact here is that the life process is from the outset essentially social. "Life is not and cannot be an affair of individual organisms. The processes of both nutrition and reproduction in all higher forms of life involve a necessary interdependence among organisms of the same species, which, except under unfavorable conditions, gives rise to group life and psychical interaction. . . . Looked at from the standpoint of the whole evolution of life, it is really the result of the breaking up of the life-process into several relatively independent centers while the process itself remains a unity." Social life is in part a function of the food process (including defense against enemies as the negative side of the food process) and in part a function of the reproductive process including as the more important part of this the care of offspring. The importance of this second factor in the author's opinion needs to be emphasized in contrast with social theories which seem to imply that the only function of the social life is to secure an adequate supply of material goods.

As the life-process is social so also is the individual mind. Consciousness is the chief connecting line between individuals living in association. "Instincts, emotions and sensations of one individual organism often seem made to fit into corresponding mental processes of other organisms; and varied means of interstimulation and response are developed." For "the life-process of the individual is only a part of the larger life-process of the group to which he belongs." When life activities—procuring of food and protection against enemies—are carried on by groups, the only way the mind can control them is through some form of psychic interconnection between the individuals of the group. "The social character of mind is an expression of the fact that it has to do with mediation of process which is carried on by several coöperating individual units; while society, the psychical interrelation of these individuals, means that there is one common process of living carried on by these co-

operating units on the psychic plane, that is, on the plane of interstimulation and response. Society in the concrete sense, in other words, may be practically defined as a group of individuals who carry on a common life-process by means of interstimulation and response."

Social coördination or "coadaptation" is then fundamental for the sociologist. It is from this point of the view that the author would explain and evaluate the various processes which have been emphasized as the essential features of social life. "Folkways" are simply regular modes of social activity in a given group of people, and might better be called "social habits," for they are found in small groups such as the family as well as in large groups. Simmel's "types of coördination or association" would on this basis get a principle for classification, and without the consideration of the actual situations in which various types arise there is practically no limit to the number that might be enumerated. Subjective expressions of coördination are found in common feelings, ideas, and beliefs. Imitation plays a part in mediating relatively simple and unconscious coördination between individuals, but it is an error to confine attention to this one element since "unlikeness of activity is necessary for many of the higher forms of social coördination." Again, sympathy and understanding are both products and instruments of coördination. Sympathy is probably proportionate "not to the amount of resemblance (Giddings) but to the harmony of the coördination between individuals."

Coördination in so far as it persists in uniform fashion may be called "social habit." As the life-process encounters shocks, disturbances, and various maladjustments, other types of communication are especially important to bring about social change; criticism, discussion, suggestion are evoked. Revolutions have for their first weapon certain destructive and disintegrating ideas. A certain anarchy often marks the violence and completeness with which habits and institutions are overthrown, and at such times the more simple and animal activities come to expression.

The processes of social adaptation may be stated not merely in objective terms as above but also in the more subjective terms of social self-control, under which would fall activities of government, education, religion, and moral ideas. The phenomena of group will, group individuality of interests, and group rivalry may also be viewed as aspects of the general processes of coördination. Successive chapters take up the rôles of instinct, feeling, and intellect in the general social process.

This general point of view enables the author to recognize the rôle of imitation (Baldwin, Tarde) and sympathy (Giddings), while not according to either the fundamental position as constitutive principle of social life. Each is the instrument of interaction. Perhaps the advantage of the author's point of view is best seen in his chapter on the theory of social progress. The anthropo-geographical theory, the biological or ethnological theory, the economic theory, the idealogical theory are all seen to rest upon the recognition of some one factor in the life process to the exclusion of others. The range and variety of human instincts on the one hand and the flexibility of human intelligence on the other are evidences of the impossibility of defining the whole life process, and consequently the lines and causes of progress, by any single one of the theories named. It may be arrogating more to the adjective "sociological" than this would necessarily carry to designate the synthetic theory of progress which would give this due recognition to all factors as "*the* sociological" theory, but without disputing over the name the point of view may be approved by the social psychologist.

Numerous queries as to detail might be raised—*e. g.*, it seems to suppose a very highly specialized set of instincts, to regard "truth telling" and "deception" as specific instincts, instead of viewing them as merely instrumental factors in larger wholes. But I remark only on a certain uncertainty as to just what is implied in a "functional" view of a process. Sometimes (*e. g.*, p. 195) it seems to be assumed that to give a functional interpretation means to explain an act, such as talking, in terms of its utility for something else. Thus it is said that the functional interpretation breaks down at certain points, for "We communicate, for example, oftentimes when we have no need of doing so in order to carry on a common life-process. We talk with each other, merely for the sake of talking without reference to the functioning of any correlated activities." The thought here seems to be that a certain level of life-process might be maintained without any members that talked just for the sake of talking; therefore such activities are superfluities and non-functional. But surely one might say that such a thoroughly stripped-to-its-fighting-weight life-process would be quite lacking in some of the equipment for good society. Must the life-process exclude all self-entertainment? On the other hand in the chapter on the Rôle of Intellect, although the author sometimes speaks of the intellect as instrumental for adaptation to environment—as though the environment were "here" already and man's only task were to fit into it—the prevailing

thought is rather of creating by ideals a "subjective environment" toward which the objective environment is to be shaped. This is not to make intellect instrumental to a (non-intellectual) life-process. It is rather to bend the life-process toward standards and ideals which could have no existence without intellect. Intellect, does not merely "function" by "mediating" social adaptations; it is itself a creative agent, a constituent factor in determining what the adaptation shall be. I do not mention this ambiguity because it is peculiar to Professor Ellwood's discussion. It is not infrequent, but the two interpretations mark fundamentally different views as to consciousness.

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RELIGIOUS PSYCHOLOGY

Psychology of the Religious Life. GEORGE MALCOLM STRATTON.
New York: Macmillan, 1911. Pp. ix + 376.

The appearance of this volume in the well-known "Library of Philosophy," edited by J. H. Muirhead, is an indication of the increasing importance of the study of the psychology of religion. It is similarly significant that it is written by one so long and fruitfully devoted to experimental psychology. The book is marked by the same clearness and charm of style as the author's earlier work on *Experimental Psychology and Its Bearing upon Culture*.

More than any other treatise in its field, it has employed materials from the oriental religions. The use of Persian, Indian, Egyptian, and Chinese religious literatures is a notable extension of the general subject. The prayer, the hymn, the myth, the sacred prophecy are regarded as the best sources, and these are found in the great canonical collections. Only secondary importance is attached to the introspective reports of individuals. The works of Tylor and Frazer are employed for the accounts of less civilized peoples, but the names of several recent investigators like Spencer and Gillen, Howitt, Rivers, and Dudley Kidd do not appear among the numerous references cited.

The book is analytical and descriptive. Approaching the subject in this way, religion is found to be marked by conflict, and this word conflict is the key to the book. There are four parts. The first treats in seven chapters of the conflicts in regard to feeling and emotion. Part two is concerned with the conflicts in regard to action and has five chapters. Conflicts in regard to religious thought

occupy ten chapters in the third part. The fourth part presents the "Central Forces of Religion" in chapters treating of The Idealizing Act, Change and Permanence in the Ideal, and Standards of Religion.

It is my impression that in spite of the author's caution in the introduction against allowing himself any human interest in such a study, his work would have gained in scientific clearness as well as in its grip upon the reader if he had placed the last part first and ordered all the others by it. As it stands one is indeed impressed by the variety and depth of the conflicts in religion but there seems to be no adequate statement of their source or end.

The author shows an intimate appreciation of the various moods and tempers of mankind. The reader is everywhere impressed by the range of insight and sympathy for the most divergent types, and by the remarkable skill in portraying them. Now it is indeed important to build out in this impressive way the complexity and variation of the religious consciousness, in its appreciation and contempt of self, its breadth and narrowness of sympathy, its opposition of gloom and cheer, its activity and passivity, its opposition of picture and thought, its contrasts of many gods and one, of divinity at hand and afar off. It is valuable to have an elaborate and artistic catalogue of these differences and conflicts, but the demand constantly asserts itself for simplification, and for explanation of all this variety by a view of the deep working causes.

This demand presses for expression in the author's own mind and there are many asides, as it were, in which this demand rises to the surface of his thought. These are doubtless the "lapses due to the infirmity of the flesh" for which the reader's charity is asked on page 2. Many readers will wish that the final fruitful and illuminating "lapse" which begins on page 325 had taken place in the introduction, so that everything might have been ordered by it from the first. On this last mentioned page an account of the idealizing act is begun which reveals the sources of all the conflicts of feeling, action, and thought in religious experience. A few sentences from this part will show how the author would explain the preceding conflicts. "It is a mark of human nature—though the same trait appears in life still lower—to transform its neighborhood." "The impulse to mould the facts until they more nearly conform to some inner rule and standard—to supplement them, if need be, by direct addition—appears in many different forms between idealization's infancy and its maturer years." "The completion of the observed world by adding to it that great unobserved world so real to the

religious, is therefore no anomaly." "The instinct to remodel the given fact to our satisfaction—at first to meet physical needs, but soon to meet the no less urgent need of beauty and justice and intelligibility—by this wide instinct all are moved." "The ideal is the picture of what will satisfy in fullest measure our desires."

Here, then, is the key. Man, like all sentient forms, is characterized by various desires and cravings. In the lower stages these are relatively few and primal. In the higher stages they branch and ramify under the pressure of environment and habit. Greater emphasis upon this principle would have brought the diversity of religions, and the contrasts within any single faith more completely under the solving notions of genetic and social psychology. It is surely a proper function of scientific psychology to show how the conflicts of individual and group experience stand related to the epochs of growth, to the run of attention, to the ground patterns determined by the struggle for existence, and by the pace set by the leaders and geniuses of races. A hint of this larger explanation appears on page 33 where the "intellectual vertigo and revulsion" of Buddhism with its endless transmigrations and repetitions is casually referred to the correlated "machine-like round of life." There are doubtless "types of character that are permanently magnetized in opposite ways," but it is the older static psychology which stops at that point, without inquiring into the environmental influences and other forces which have played the part of the magnets.

Religion is conceived as the supreme expression of the idealizing activity. It is well defined (page 343) as "man's whole bearing toward what seems to him the Best, or Greatest—where 'best' is used in a sense neither in nor out of morality, and 'greatest' is confined to no particular religion." Therefore, "no clear line marks the transition from religion to other human activities." The Best is predominantly social (pages 337 f.) and would seemingly be regarded as primarily social but for "motives connected with high curiosity" apart from any practical interest. The author's mild dissent from recent attempts to state religion in terms of the social consciousness is seen in the following: "The reverence which men have shown the Highest has usually been, not alone because it fulfilled their social needs, but also because of its satisfaction to sensuous and æsthetic and causal and logical needs, which grow, it is true, by the mutual friction and support of men, but seem not to originate in this way nor to be part and parcel of the social feeling itself."

E. S. AMES

Prophezeiungen: Alter Aberglaube oder neue Wahrheit? M. KEMMERICH. München: Langen, 1911. Pp. vi + 435.

Dr. Kemmerich tells us that his study of prophecy has completely altered his understanding of that phenomenon. He was at first convinced that only superstitious persons could believe in the announcement of future events; and he attributed the realization of certain "prophecies" either to luck, to simple coincidence, or to clever conjectures. But he has come to believe that future events can be seen in advance. His book is intended to demonstrate that that fact is scientifically established. "The belief in prophecy is not an antiquated superstition. It is a new truth of which we make a strict demonstration. We know now that sight into the future exists."

Let it be clearly understood that the author's purpose is simply to verify the existence of the fact. That is without doubt the first task of science. Whether the fact can be explained and how it is to be explained are questions independent of the one with which he is concerned.

The book contains twelve chapters. The third indicates the method of the demonstration and answers objections. The twelfth establishes scientific conclusions regarding prophecy. The ten other chapters discuss the facts; after mentioning antiquity, the Middle Ages, the modern period, the author examines particularly: (1) The prophecy of the Abbé Hermann of the Cistercian Monastery of Lehnin in the year 1300, regarding the fate of the House of Brandenburg; (2) Christina Ponitowssken, the clairvoyant, of the seventeenth century and her prophetic visions; (3) the prophecies of Christian of Heering of Prossen in the eighteenth century; (4) the prophecy of Johann Adam Müller at the beginning of the nineteenth century; (5) the prophecy of Cazotte on the French Revolution; (6) the prophecies of Madame de Ferrièm, a contemporary; (7) and finally, the prophecies of Michel Nostradamus in the sixteenth century.

It is impossible in a brief account to summarize the discussion of all these facts, but however surprised one may be at finding the prophecies of Nostradamus seriously examined with the purpose of showing their agreement with future events, one is compelled to admit that the discussion is conducted with much logical strictness. Certain quatrains of the *Centuries* of Nostradamus are truly very curious. They are authentic, drawn from events anterior to the events designated, sufficiently clear in spite of their intended obscurity. They provide the author with several truly interesting

examples of "true" prophecy. Demonstrations of such a kind cannot be abbreviated; we refer the reader to the book.

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Das Zungenreden, geschichtlich und psychologisch untersucht. E. MOSIMAN. Tübingen: F. C. B. Mohr, 1911. Pp. 137.

This book was originally written in English in answer to a prize-question offered by the McCormick Theological Seminary. After revision and completion, with the assistance of Professor Johannes Weiss, of Heidelberg, it was published in Germany. It comprises historical researches on the existence of the facts of speaking with tongues (pp. 1-83), psychological explanations (pp. 86-124), and a final chapter, rather theological, in which are discussed chiefly the events of the Pentecost as they are related in the Acts of the Apostles.

The problem of "glossolalia" and of the "gift of tongues" goes back to certain accounts of the New Testament. There these manifestations of involuntary speech are attributed to the Holy Spirit. Other historical manifestations nearer us permit a fuller study of the question and throw some light upon the facts, and their psychological explanation, often permitting one to cast aside the hypothesis of the intervention of spirit.

In addition to the manifestations related in the New Testament, considered by the author in the first three chapters, two chapters are devoted to other instances: among the Montanists, the Camisards, the Jansenists, the Irwingiens, and in recent revivals (in Wales, in India, etc.).

The theory of the automatic and unconscious movements of the organs of phonation, produced by our subconscious activity, suffices to explain a great many cases. A sort of internal suggestion takes place and sets in activity the nervous centers. At times the sounds produced have no sense; at times they are intelligible only to those to whom the power of interpretation is given; at times they are in the language of the subject and of the auditors; at times they are a tongue foreign to the subject. It is well known that in this last case very curious causes leading to a misinterpretation of the phenomenon have been discovered. The author affirms that there exists no incontrovertible instance of a true use of a foreign tongue (p. 118). A woman in Chicago utters Chinese words, but she has heard them in a Chinese laundry. Another person speaks Hebrew words, but on investigation one discovers that she has lived as a servant with a

Hebraic scholar who was in the habit of repeating Hebrew texts aloud.

The question dealt with in the last chapter is the relation which exists between the gift of tongues mentioned in the New Testament and "glossolalia" in general. The author identifies them and gives them both a purely psychological explanation; but in order to do so he is led to affirm that the Biblical account is not exact (*ungeschichtlich dargestellt*). At this point the question becomes one of historical criticism, or of theology, with which we are not concerned here. The reasons advanced by Mosiman appear to us to some extent arbitrary. They are not convincing. There are theologians who hold an opposite opinion (comp. Pratt, *Théologie de Saint-Paul*. Paris: Beauchesne; pp. 175, 184).

An extensive bibliography is added.

JULES PACHEU

PARIS

L'Expérience Mystique et l'Activité Subconsciente. J. PACHEU.
Paris: Perrin, 1911. Pp. 312.

This interesting work contains a simple and clear exposition of Mystical Union (the central fact of mysticism), and a criticism of the subconscious theory as applied to that experience. Using first-class authorities, the author separates clearly the affective from the noetic element at every one of the several degrees of that experience. It includes feeling and also knowledge: the Mystic is aware, even if in an obscure way, of the divine presence.

The exposition is done with much exactness; it evinces a thorough knowledge of the topic. The author insists very properly upon the ethico-religious value of this experience; he shows the harmonious development to which mystics tend beyond asceticism; one sees very clearly how the mystical experience makes part of the religious life. The theory which would bring back these facts to mental pathology is vigorously discussed.

Can mystical experience be explained as an eruption from the subconscious? Must it be supposed that the mystical intuition is nothing more than a revelation of the subject to himself, helped by his reflection and his work and which, having ripened subconsciously, appears to him external and superior to himself? The interruptions and the disproportion which characterize these states have seemed to some adequately explained by the hypothesis of the subconscious, on condition that it be given its full value, and that it should be assim-

lated to, for instance, scientific and artistic invention. Against this hypothesis, the author formulates the following objections: (1) How are we to explain on this hypothesis the sporadic and at times unique character of the mystical intuitions? If the subconscious is the author of them, it should easily lead to a flowering of phenomena of that kind. (2) The efficacious play of the subconscious supposes a kind of mental disaggregation; how is one to conciliate these dissociations with the admirable unity of the mystical life? (3) The continuity of memory and of consciousness in the mystics seems to establish the unity of their consciousness. (4) In order to explain the mystical facts, one is compelled to enlarge the subconscious hypothesis to such a degree that it loses all precise meaning. Certain authors, particularly M. Delacroix, endow the subconscious so richly that it "becomes a marvellous fairy more difficult to scientifically imagine than Viviane, or Morgane, the fay, or simply the divine reality of which the mystics speak." The posited creative subconsciousness—a dynamic, constructive automatism—is in fact copied after the descriptions of the great mystics. "This hypothesis, suggested by the facts which are to be explained, is applied to them as a sufficient explanation. There is a gap and an apparent *petitio principii*: that which is assumed is precisely that which is in question."

Our author is of the opinion that subconsciousness cannot be left to its own resources; it seems rather an instrument in the hands of a superior power, God. As psychologists, our conclusions cannot affirm God; but we have not the right to exclude Him, in fact psychology seems to point to Him.

In closing, the author quotes from a letter in which M. Delacroix explains how he conceives the relation between psychology and metaphysics and also religion.

The only critical remark which I will make refers to the fourth objection. The moment always comes when an hypothesis resembles the facts for which it is intended as an explanation; it must perforce contain them. The question is whether it contains only those facts; if so, the hypothesis is in truth merely the expression of those facts and it cannot serve to go beyond them, to relate them to other facts. But is this truly the case of the subconscious hypothesis? I do not think so. The authors criticized by M. Pacheu have merely complicated an hypothesis already in existence in order to make it include the new facts in question; and they have found support in intermediary facts, for instance, the rôle of subconsciousness in artistic and scientific invention.

The book of M. Pacheu manifests a very sincere and talented effort to place the religious reader face to face with the analyses and theories of the psychologists, and to draw from them whatever is possible from the point of view of religion. This book shows that psychologists and religious souls can walk together for a considerable time. If the moment comes—the moment of explanation—where they diverge, they know at least on what they agree and on what they disagree. This book shows also that serious differences can be indicated with much tolerance and perfect courtesy.

H. DELACROIX

SORBONNE, PARIS

Mysticism as Seen through its Psychology. W. E. HOCKING. *Mind*, 1912, 21, 38-61.

This is in part a criticism of the views concerning mysticism held by Royce, Godfernaux, Delacroix, and Leuba, and in part a positive theory (both psychological and metaphysical) of the mystic consciousness. Royce's mistake, according to Hocking, is in failing to distinguish the mystic's motive, which is worship, from the motive of speculation in general. Leuba's interpretation of the mystic's love as a branch of the sexual impulse is only a half truth; the whole truth being that sexual love is a part of the mystic worship. Godfernaux is right in viewing rhythm as the great characteristic of the mystic life, but he is mistaken in identifying this with the vital rhythm of cœnesthesia. Delacroix recognizes the rhythm of the mystic consciousness but regards it as not absolutely essential and as, in fact, outgrown by the greater mystics. As a fact the mystic never does and never can get beyond this rhythm, for it is a function of his will and is correlated with the laws of attention. It is, in fact, based upon the psychological and epistemological law of alternation,—the necessity of turning from the whole to the part and from the part to the whole.

JAMES B. PRATT

WILLIAMS COLLEGE

Essai d'une Classification du Mystique. F. PICAUVET. *Rev. Phil.*, 1912, 74, 1-26.

The mystics have been classified according to two principles: the perfection they aimed at, and their nervous abnormal phenomena. The author would make three classes: (1) The Mystics who seek a development of their personality by means of union with the Su-

preme Perfection, but who do not make use of theurgical and religious practices. (2) The Mystics who seek God in order to realize a fuller personality and who make use of the well-known methods of mystical worship. (3) The Mystics who do not aim at individual perfection, whose physiological misery is as profound as their psychological deficiencies.

J. H. LEUBA

BRYN MAWR COLLEGE

Les Etats Mystiques Négatifs. G. TRUC. Rev. Phil., 1912, 73, 610-628.

After considering in a previous paper the state of grace, the author takes up in the present article correlated negative states: lukewarmness, "acedia," dryness. He makes a detailed and careful descriptive analysis of these states. His chief conclusions are: (1) These negative states are functionally related to the state of grace. They involve regret for an affective experience which one has previously realized, or which one despairs of ever obtaining; they include therefore a feeling of irritation at one's impotency. (2) These states are only particular cases of experiences existing outside the religious life.

J. H. LEUBA

BRYN MAWR COLLEGE

The Several Origins of the Ideas of Unseen Personal Beings. JAMES H. LEUBA. Folk-Lore, 1912, 23, 148-171.

The Varieties, Classification, and Origin of Magic. JAMES H. LEUBA. American Anthropologist, 1912, N. S., 14, 350-367.

Professor Leuba, an original thinker in the field of religious psychology, discusses in the articles under review, two fundamental questions interesting alike to the psychologist and to the ethnologist, questions concerning which there is still, and rightfully so, not a little disagreement among even the most competent authorities. Rejecting the theory of the origin of the ideas of superhuman personal powers in some one class only of phenomena, *e. g.*, dreams and related states (Tylor), worship of the dead (Spencer), personification of natural objects (Max Müller), a theory ascribed by him to "the passion for simplicity and unity" in anthropologists and historians, he adduces psychological and historical evidence in support of the following four propositions: (1) Gods grew out of several different ideas of superhuman beings. (2) These beings had independent origins. (3) The

attributes of the gods differ according to their origin. (4) The historical gods are usually mongrel gods, the outcome of the combination of characteristics belonging to superhuman beings of different origins.

In his position as to the non-unitary origin of such beliefs Professor Leuba places himself in the company of the so-called "American school" of anthropologists, who for some years past have assumed the same attitude with respect to "totemism," and other phenomena of a socio-religious character, which the earlier observers and interpreters of the mental activities of non-civilized peoples, almost without exception, considered as having had a unitary origin. Another point argued for, and quite properly, is that several of the sources indicated may have operated simultaneously—"so that several gods of different origins may have, from the first, divided the attention of the community"; and, moreover, *succession* (not at all limited to any one order), as well as *simultaneity*, is possible,—thus, "a ghost-ancestor may have first attained dominance, and, later on, a Great Maker." The idea of a "Maker" can occur very early in the history of the races, and Professor Leuba does not err in stating that "it may be that a crude conception of a Creator is attained even earlier than that of a soul or a double." Today, the belief in the existence of God, Professor Leuba holds, "rests almost entirely" on experiences included under "the needs of the heart" and "the needs of conscience,"—such empirical data (together with the metaphysical arguments) as dreams, hallucinations, trances, personification of striking phenomena, the idea of a Maker, etc., "having lost all or almost all the value they had once as prompters of the belief in God."

The question of "primitive montheism," so much discussed of late by Andrew Lang, Father Schmidt and others, Professor Leuba answers by pointing out that "the High Gods proceeded from an independent and specific source; they are, or were originally, the Makers." The fact that low spirits and not the High God are worshipped among primitive peoples does not represent a deterioration from the earliest condition of humanity, but "rather the facts are consistent with a natural development and indicate the presence of no factor not operative in modern progressive societies." Something might perhaps be urged against the author's derivation of the "High Gods" from the "Makers" alone. His emphasis on the facts of childhood is worth attention. Professor Leuba deprecates the application of the term "monotheism" to belief of the uncivilized in the "High God," since it by no means implies that there exist no other gods but him.

By "magic" Professor Leuba understands "those practices intended to secure some definite gain by coercitive action in essential disregard (1) of the quantitative relations implied in the ordinary and in the scientific dealings with the physical world; (2) of the anthropopathic relations obtaining among persons." To this he adds that "although magic never makes an anthropopathic appeal, it frequently brings to bear its peculiar coercitive virtue upon feeling beings." The aim of magic is then to compel souls, spirits, or gods to do the operator's will, or prevent them from doing their own. As is noted (p. 352), it is only by far-fetched explanations that several types of magic can be brought within the limits of Frazer's classification into "homeopathic (or imitative)" and "contagious." Examples of these are "certain dances performed by the women when the men are engaged in war" (*e. g.*, among Kafirs of the Hindu Kush, Yuki Indians, natives of Madagascar, etc.), and the very large and significant class of magic-phenomena known as "will-magic."

Professor Leuba offers a classification of his own, viz. (1) principle of repetition; (2) principle of transmission of an effect from one object to another (sympathetic magic); (3) principle of efficiency of will-effort. The conceptions of the savage, the author thinks, are not "clear and definite," but "hazy and fluid." This generalization can hardly apply to all primitive peoples, much less to all individuals among them. The origins of magical behavior, according to Professor Leuba, while not capable of interpretation simply from the principles of association, may be classified, nevertheless, according to the kind of association they illustrate. Considering the nature of the power involved, magical practices may be grouped as follows: (1) practices in which there is no idea of a power belonging to the operator or his instrument, and passing thence to the object of the magical art (much of so-called sympathetic magic, many taboos, most modern superstitions); (2) non-personal powers are believed to belong to the magician himself, or to particular objects, such as the magician's instruments, and to pass from these into other objects, or to act upon them so as to produce certain effects; (3) will-magic, including the cases in which the magician feels that his will-effort is an efficient factor.

Among the principles of explanation (of unequal value) of magical behavior the author cites the following phenomena: Children often amuse themselves by making prohibitions and backing them up with threats of punishment,—the make-believe of one person may be taken quite seriously by another; threats of untoward happenings,

made for the purpose of preserving things vital to the life and prosperity of the tribe; the motive which leads civilized people to make vows nowadays; the spontaneous response of the organism to specific situations. Besides these cases, in all of which "movements and behaviors appear independently of any magical intention, and afterward acquire a magical significance," there comes a time, when "magic no longer arises only by chance, but new forms are created deliberately," and "from this moment there must have been a tendency to treat, according to more or less definite principles, every difficult situation." And here belong most of the "like produces like" practices found all over the globe in all ages of mankind.

Professor Frazer, in the opinion of the author, "seems to have overlooked the fundamental difference between mere association of ideas and the essential processes involved in magic." Magic cannot be explained as "a simple (mistaken) recognition of the similarity and contiguity of ideas."

ALEXANDER F. CHAMBERLAIN

CLARK UNIVERSITY

On Faith in its Psychological Aspects. B. B. WARFIELD. The Princeton Theol. Rev., 1911, 9, 537-566.

Professor Warfield's paper is a carefully written and convincing discussion of the meaning of the word belief, and in particular of the difference expressed by "belief" and "knowledge."

"Matters of faith," he writes in a partial summary, "are different from matters of knowledge—not as convictions less clear, firm or well-grounded, not as convictions resting on grounds less objectively valid, not as convictions determined rather by desire, will, than by evidence—but as convictions resting on grounds less direct and immediate to the soul, and therefore involving a more prominent element of trust, in a word as convictions grounded in authority, testimony as distinguished from convictions grounded in rational proof. The two classes of convictions are psychologically just convictions; they are alike, in Dr. Baldwin's phrase, 'forced consents'; they rest equally on evidence and are equally the product of evidence; they may be equally clear, firm and assured; but they rest on differing kinds of evidence." It is the "open implication of 'trust' in the conception of 'belief' which rules the usage of these terms."

Now, as there is "an element of trust in all our convictions, 'faith,' 'belief,' may be employed of them all." "In what we call religious faith this prominent implication of trust reaches its height." "Faith in God, and above all, faith in Jesus Christ is just trusting Him in its purity."

In the remainder of the paper (pp. 557-566) the author examines critically, in the light of his analysis, the opinion of certain theologians.

It appears to me unfortunate that "faith" is used throughout this article as synonymous with "belief," for these two terms cover a range of mental experience wide enough to make possible a discriminating use of these terms.

One is surprised to find that the only contemporary psychologists who apparently have been consulted are those who wrote on this topic in the Dictionary of Philosophy and Psychology. I cannot help believing that a wider knowledge of psychological science on the part of theologians would redound to the advantage of both theology and psychology.

J. H. LEUBA

BRYN MAWR COLLEGE

The Journal of Religious Psychology, including its Anthropological and Sociological Aspects, edited by G. STANLEY HALL and ALEXANDER F. CHAMBERLAIN. Volume V., 1912.

- (1) *The Belief in Immortality*. SIMON SPIDLE. Pp. 5-51.
- (2) *Satan and his Ancestors from a Psychological Standpoint*. COLLYS F. SPARKMAN. Part I. Historical Development, pp. 52-86; Part II. The Rise, Growth and Death of Satan, pp. 163-194.
- (3) *The Genetic View of Berkeley's Religious Motivation*. G. STANLEY HALL. Pp. 137-162.
- (4) *Fear in Religion*. W. D. WALLIS. Pp. 257-304.
- (5) *The Psychology and Pedagogy of Doubt*. JOSIAH MORSE. Pp. 418-428.
- (6) *The Psychology of Religion*. JAMES B. PRATT. Pp. 383-394.

With the appearance of its fifth volume, *The American Journal of Religious Psychology and Education* modified its name and changed its editors. The disappearance of "Educational" and the appearance of "Anthropological and Sociological" indicate sufficiently the change that has taken place in the field covered by the journal.

(1) The first parts of this paper deal in a sketchy way with the several concepts of immortality; with the different theories of the origin of the belief; and with the grounds upon which the belief rests.

The last part, entitled "Present Status of the Belief," is an investigation by means of a *questionnaire* containing no less than thirty questions. It is much easier to draw false than right conclusions from the one hundred and seventy answers which the author received. Of the one hundred and four answers coming from the

professional classes, seventy-five announce a belief in personal immortality. Apparently all these regard the doctrine of Christ's resurrection as "the crowning evidence of a future life." Of the forty-six answers received from high-school pupils only one doubts the reality of an after-life. And of the twenty answers from college students, again only one doubts personal immortality.

The information I have secured upon the belief of college students indicates, what is indeed apparent to any one acquainted with the times, that the *questionnaire* of Mr. Spidle fell into the hands of, or was answered almost exclusively by, persons who believe in immortality, but was not answered by *all* the persons belonging to the classes to whom the *questionnaire* was sent.

(2) The first half of Sparkman's paper deals with the historical development of Satan's forebears from antiquity to modern times. The second half seeks to discover the reasons for the existence of a belief that has taken such a deep hold on human nature. The author proposes to apply to the idea of the devil the psychoanalysis used by Freud for the discovery of psychic disorders. "Using race as a psychological unit, may it not have forgotten many processes analogous to those of the individual? May not its horizon have broadened and its consciousness *in toto* have found certain ideas unpalatable? If so, . . . the devil could be, in Freud's own language regarding the individual, 'the created output in a sublimated manifestation of various thwarted and repressed wishes of which it is no longer conscious.'" In this view the devil has been "an outlet for otherwise nauseating conscious thoughts."

(3) "To explain the philosopher psychologically is one of the chief new duties which our science now owes to the great speculative minds of the past." Berkeley is, according to Dr. Hall, a favorable example for "this new psychoanalysis." In a brief account of the philosopher's life we are shown how by his temperament and education he was tempted to a denial of the reality of matter. "His all-dominant wish was to exalt the cause of faith and reason above, and at the expense of, that of sense." "He would make a great *coup* which should bring consternation to the critics of religion. . . . He would impeach and discredit the most ancient trusted oracles of mankind . . . by showing that matter too was really immaterial, was only a practical postulate on the plane of sense, which must be, in fact, everywhere accepted by an act of faith."

His romantic missionary enterprises and his advocacy of the wonderful properties of tar-water confirm the indications of his

early life, and throw such additional light upon the motivation of his philosophy that no student who would understand its *raison d'être* should omit the reading of *Siris*, during his lifetime the most popular of his works, but now almost forgotten.

(4) The chief purpose of the author seems to be two-fold. First to show that awe and reverence are essential and invariable elements in every true religious consciousness; secondly that the foundation of religion rests in individual as well as in social psychology. Here he opposes the theory of Durkheim according to which religion can be explained only by reference to social consciousness.

The paper reports a large number of experiences from the life of more or less primitive peoples, all of which elicit the same reaction, namely fear.

The author's definition of religion by means of fear, awe and reverence is subject to the criticism which I have offered in several of my writings. His contention that the origin of religion must be sought both in individual and in social psychology appears so nearly self-evident that when it is contradicted, it must be, it seems to me, because of a verbal misunderstanding.

(5) "The thesis of this paper is that doubt and belief are contrary psychical states, that the law of contrast holds between them, and that belief is the inducing or positive state, and doubt the induced or negative state." It is the inculcation in youth of beliefs that are antagonistic to those which experience interpreted by modern knowledge produces, which is the cause of the pathetic state of doubt so common in adolescence. "Doubt is not necessary; it is not a natural heritage of youth;—it is an unhappy state induced by dogmatism and unwise pedagogy."

(6) After a critical discussion of the three sources from which the psychologist of religion obtains his facts (individual experience in autobiographies, letters; answers to definite questions; objective expressions of social religion furnished by history, anthropology, and literature), Pratt passes to the question, What is the proper attitude of the psychologist toward the commonly assumed objective reality of the cause, or causes, of religious experiences? We are told that for its own protection science must act as if there were no interruptions in the sequence of phenomena. The psychologist should content himself with describing the phenomena as he finds them, leaving to others the guess work by which apparent breaks in experience are bridged over, that is, the hypothesis of supernatural interference and the "scientific" hypothesis of unconscious activity and others.

"I cannot help thinking that it would ultimately lead to great disappointment, if not to positive scepticism, if we should sanguinely expect, as I fear many cultured religious people have been led to expect, that the psychological study of religion can demonstrate any of the truths of theology. And equally misleading does it seem to me to suppose, as some leading 'functional' psychologists seem to do, that the psychology of religion can ever so develop as to be in any sense a substitute for philosophy or theology." Psychology "must content itself with a description of human experience, while recognizing that there may be spheres of reality to which these experiences refer and with which they are possibly connected, which yet cannot be investigated by science."

There is not space here for a critical discussion of Professor Pratt's position. I may however be allowed to refer to my treatment of certain aspects of this problem on pages 244-261 of my book *A Psychological Study of Religion; its Origin, Function and Future*.

JAMES H. LEUBA

BRYN MAWR COLLEGE

Zeitschrift der Religionspsychologie, 1911. Vol. V.

- (1) *Aufgabe und Methode der Religionspsychologie*. HERMANN BAUKE. Pp. 97-104.
- (2) *Zur Frage nach der transzendental-psychologischen Methode in der Religionswissenschaft*. GEORG WOBBERMIN. Pp. 225-234.
- (3) *Religiöses Erkennen und Erkenntnistheorie*. K. A. BUSCH. Pp. 209-218.
- (4) *Grundsätze und Aufgaben der Religionspsychologie*. ROLAND SCHUTZ. Pp. 245-263.
- (5) *Das religionspsychologische Problem* Zinzendorf. H. LEHMANN. Pp. 327-336.
- (6) *Zur Psychologie des hysterischen Madonnenkultus*. O. PFISTER. Pp. 263-271.

(1) The first of these papers is a criticism of an address by Wobbermin. The second is a retort by the latter.

Bauke defends the so-called "American school of religious psychology" against Wobbermin who finds it too exclusively naturalistic, and who, in order to make it adequate, would complete it by the addition of a "*transzendental-psychologischen Aufgabe mit transzendental-psychologischer Methode*." Bauke holds that the American psychologists have remained true to the methods of a strictly empirical science and believes that the transcendental-psychological

method of Wobbermin does not belong to the psychology of religion, but to theology.

(2) In his answer Wobbermin accuses Bauke of not having understood him. He maintains that that which he means by the phrase which we have quoted does not include a "*spekulativ-metaphysische Bearbeitung psychischer Erscheinungen*;" he does not mean to enter the field of the normative sciences. The psychological analysis of religious experience "from the point of view of our interest in truth (*Wahrheitsinteresse*)" deals with the motives and tendencies which are fundamental to the system of religious thought. The transcendental-psychological analysis is interested not in the religious consciousness of particular individuals in its particular forms, not in the varied individual expressions of religious life, but in the establishment of religious thought as a whole. "That is not a purely empirical investigation, it is an investigation directed by a problem transcendently formulated. Nevertheless, the investigation remains within the field of psychological analysis. It is therefore not normative." Wobbermin rejects the imputation that by his transcendental-psychological procedure he seeks to draw conclusions regarding the objective reality of the object of religious belief. He believes that theology should find help in psychology, but that no help can come to it from empirical psychology unless it be extended by the method he advocates. Alone the transcendental-psychological point of view can produce a body of conclusions useful to theology.

If Wobbermin uses here "transcendental" in the sense of "trans-individual," he is certainly justified in demanding that the psychologists of religion do not neglect that part of the field of religious experience. And if this is the conclusion of the whole matter, Bauke would, I think, offer no objection. But then would not the word "sociological" advantageously replace "transcendental"?

(3) This is one of the many defences of religion against psychology. But as a matter of fact it is not religion such as we find it in history that is successfully defended, but a conception of it which is far from corresponding exactly to the religion of those without whom religion as a social institution would never have existed. Religion is conceived here as concerned with fundamental judgments of worth upon the existent, including scientific knowledge. Religion is therefore very far from expressing a scientific knowledge similar to the knowledge of the natural or of the psychological sciences. It is concerned with value-judgments, not with the establishment of a system of causal connections. Religion moves in the sphere of the

absolute, not in that of the relative. Therefore its object is beyond the reach of science.

The conceptual formulation of religious beliefs is to be considered, we are told, as having simply a symbolic significance; they should be looked upon as poetical forms. When thus considered, the ideas of heaven, of the Kingdom of God, of the Heavenly Father are removed from the reach of psychological science.

Who would deny that the Absolute is outside of the province of psychology? But the religious peoples who have made the historical religions, believed not in an Absolute, but in a personal God or gods and it is only because they believed in the reality of personal gods that religions came into existence. With the Absolute *really conceived as an Absolute*, religions as such have never had anything to do.

(4) This paper considers the sources from which the psychology of religion can draw its material, the task of that science, and its relation to theology.

(5) We have here a part of the polemical discussions aroused by the monograph of Dr. Oskar Pfister, *Die Frömmigkeit des Grafen, L. von Zinzendorf*. In that essay Zinzendorf appears as having "sexualized piety."

(6) This paper reports the psychoanalysis of a neuropathic youth. It is of no particular significance.

JAMES H. LEUBA

BRYN MAWR COLLEGE

William James als Religionsphilosoph. K. A. BUSCH. Göttingen: Vandenhoeck & Ruprecht, 1911. Pp. vii + 88.

The author of this monograph was a student at the Harvard Divinity School during the year 1909-1910, and there came under James's personal influence,—a fact which probably suggested the writing of the book and seems certainly to have influenced its tone. For though Dr. Busch cannot agree with many of James's conclusions, he shows throughout an intelligent sympathy with them and a real understanding of James's spirit. The work is hardly to be compared with Boutroux's admirable little book on James, yet it does well what it sets out to do, namely to give a systematic presentation of James's philosophy of religion. That there is need for such a work—and not only in Germany but here in America as well—is of course plain to every reader of James. James was no "systematic philosopher" and his views on religious subjects are scattered through most of his works. And for the task of systematization in general

certainly no one is better equipped than a German—especially if he has (as is the case with Dr. Busch) a sympathetic appreciation of the person systematized. Any one wishing an orderly exposition of James's attitude toward religious problems will find it here, duly set forth with nothing of importance omitted and with nothing out of place, all the way from *Religionspsychologie* to the "*Jamesche Metaphysik*."

JAMES B. PRATT

WILLIAMS COLLEGE

The Idea of Feeling in Rousseau's Religious Philosophy. A. C. ARMSTRONG. Arch. f. Gesch. d. Phil., 1911, 24, 242-260.

This paper is an altogether admirable exposition of its subject. Its chief interest to the psychologist lies in directing attention to the variety of experiences that may be included in such terms as "feeling" and "heart" when appealed to for decision in questions of religious belief. Thus Rousseau's *sentiment intérieur*, the source of confident assurance, is shown to include logical as well as affective elements, to denote self-consciousness and the intuition of principles and, again, desire, emotion, aspiration and the appreciation of ideal values. Rousseau himself seems to have been prevented by the bent of his genius from having any conception of this variety; he certainly contributes nothing directly to elucidate it. By his emphasis on the affective side of our nature as over against the "analytic understanding" he powerfully influenced not only the constructive philosophy, but also the psychology of feeling and emotion in the eighteenth century, and his observations, particularly his self-revelations, still furnish rich material for psychological study. But he was too little of a systematic thinker and too lacking in scientific interest to solve the problems involved in the movement he inaugurated.

H. N. GARDINER

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BOOKS RECEIVED DURING NOVEMBER

- SCHOPENHAUER, A. *Essai sur les apparitions et opuscules divers.* (Traduction française par Auguste Dietrich.) Paris: Alcan, 1912. Pp. 201.
- MARTIN, E. G. *The Measurement of Induction Shocks.* New York: Wiley and Sons, 1912. Pp. vii + 117.
- Bulletin No. 4 of the Government Hospital for the Insane. Washington: Government Printing Office, 1912. Pp. 94.
- DESSOIR, M. *Outlines of the History of Psychology.* (Translated by FISHER, D.) New York: Macmillan, 1912. Pp. xxix + 278. \$1.60.
- MARVIN, W. T. *A First Book in Metaphysics.* New York: Marvin, 1912. Pp. xiv + 271. \$1.50.
- WUNDT, W. *An Introduction to Psychology.* (Translated by PINTNER, R.) New York: Macmillan, 1912. Pp. xi + 198. \$0.90.
- MEISSNER, S. R. DE. *There are No Dead.* Boston: Sherman, French & Co., 1912. Pp. 116. \$1.00
- SCRIPTURE, E. W. *Stuttering and Lispering.* New York: Macmillan, 1912. Pp. xiv + 251. \$1.50.
- BRETT, G. S. *A History of Psychology, Ancient and Patristic.* London: George Allen & Co., 1912. Pp. xx + 388. \$2.75.
- RENOUVIER, C. *Traité de logique générale et de logique formelle.* 2 vols. Paris: Lib. A. Colin, 1912. Pp. ix + 397, 386. 8 fr.
- MC EWEN, J. B. *The Thought in Music.* New York: Macmillan, 1912. Pp. viii + 233. \$1.25 net.
- AVELING, F. *The Consciousness of the Universal.* London: Macmillan, 1912. Pp. x + 255. 5/ net.
- KUHLMANN, F. *A Revision of the Binet-Simon System for Measuring the Intelligence of Children.* (No. 1 of the Monograph Supplements of the *Journal of Psycho-Asthenics.*) Faribault, Minn.: Minnesota School for Feeble-Minded and Colony for Epileptics, 1912. Pp. 41. 11 Plates.

SUPPLEMENTARY BOOK-LIST

- DUSSAUZE, H. *Les règles esthétiques et les lois du sentiment*. Paris: Alcan, 1911. Pp. 541.
- HOCHFELD, S. *Das Künstlerische in der Sprache Schopenhauers*. Leipzig: Barth, 1912. Rp. xi + 170. M. 5.
- LATOUR, M. *Premiers principes d'une théorie générale des émotions*. Paris: Alcan, 1912. Pp. 300. 3 fr. 50.
- LEVY-SUHL, M. *Ueber experimentelle Beeinflussung des Vorstellungsverlauf bei Geisteskranken*. Leipzig: Barth, 1911. Pp. vi + 142.
- MÜNSTERBERG, H. *Psychologie und Wirtschaftsleben*. Leipzig: Barth, 1912. Pp. viii + 192. M. 2.80.
- OSSIP-LOURIÉ. *Le langage et la verbomanie*. Paris: Alcan, 1912. Pp. 275.
- RANSCHBURG, P. *Das kranke Gedächtnis*. Leipzig: Barth, 1911. Pp. ix + 138.
- SCHMIED-KOWARZIK, W. *Umriss einer neuen analytischen Psychologie*. Leipzig: Barth, 1912. Pp. vi + 318. M. 7.
- SCHNEIDER, K. C. *Tierpsychologisches Praktikum in Dialogform*. Leipzig: Veit, 1912. Pp. 719.
- SIMPSON, B. R. *Correlations of Mental Abilities*. (Contributions to Education, No. 53.) New York: Teachers College, 1912. Pp. 122. \$1.00.
- TAYLOR, D. *The Composition of Matter and the Evolution of Mind*. London: Walter Scott, 1912. Pp. 176.
- TÖNNIES, F. *Thomas Hobbes. Der Mann und der Denker*. (2. erw. Aufl. der Schrift "Hobbes Leben u. Lehre.") Osterwieck-Harz u. Leipzig: Zickfeld, 1912. Pp. xvi + 249. M. 4.
- Traité international de psychologie pathologique*. Paris: Alcan, 1912. Pp. vii + 1086.
- Anales de psicología. Trabajos del año 1910*. Buenos Aires: "La Semana Médica," 1911. Pp. 359.

NOTES AND NEWS

DR. C. E. FERREE, of Bryn Mawr College, is one of the members of the Sub-committee on the Hygiene of the Eye, of the American Medical Association, the object of which is to study the effect of different kinds of lighting systems on the eye, with the purpose of conserving vision. The work done by Dr. Ferree during the past year, under the auspices of this committee, was reported in a paper read by him at the convention of the Illuminating Engineering Society held at Niagara Falls on September 17, and again before the Philadelphia Section of this Society, on October 18.

DR. J. E. W. WALLIN, Director of the Psychological Clinic in the University of Pittsburgh, has been appointed R. B. Mellon Fellow in the division of smoke investigation in the department of industrial research of the university, with the immediate duties of making a preliminary survey of the literature bearing on the psychology of smoke, and of outlining a plan of investigation in this field. Owing to the lack of bibliographies bearing on this topic, he will be pleased to receive statements from any one who has made observations on the mental influences of smoke, or who is in a position to supply references.

THE New York Branch of the American Psychological Association met in conjunction with the Section of Anthropology and Psychology of the New York Academy of Sciences on November 25. The following papers were read: "Difference-Tones and Consonance," by Professor F. Krueger, Professor of Philosophy and Psychology, University of Halle-Wittenberg, Kaiser Wilhelm Professor in Columbia University; "The Attempt to Measure Mental Work as a Psycho-Dynamic Process," by Professor Raymond Dodge, of Wesleyan University; "The Psychology of the Earthworm," by Professor Robert M. Yerkes, of Harvard University.

ON November 11, Dr. H. L. Hollingworth, of Columbia University, read a paper on "The Relation of Psychology to Medicine and Law" at a meeting of the Society of Medical Jurisprudence.

THE twenty-first annual meeting of the American Psychological Association will be held at Western Reserve University, Cleveland, on Monday, Tuesday, and Wednesday, December 30 and 31, and January 1.

THE present number of the BULLETIN, dealing especially with social and religious psychology, has been prepared under the editorial care of Professor G. H. Mead.

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Names of contributors are printed in SMALL CAPITALS, and the page numbers of the contributions in **Full Face Type**. In the case of authors reviewed or summarized the page numbers are in *Italics* and in the case of mention in the notes and book lists they are in Roman Type.

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